ION450

Service Manual

Notice to users

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1. General Information

General Information, providing a short all-round description of the instrument functions.

2. Service Information

Service Information, describing the service policy and the procedures for replacing parts or modules.

3. Spare Parts

Spare Parts, listing spare parts available for replacement.

4. Control procedure

Control Procedure, describing the procedures for controlling the instrument with respect to its specifications.

5. Troubleshooting

Troubleshooting, listing error messages and codes, describing general troubleshooting techniques.

6. Electronics

Electronics, describing the main electronic functions.

7. Drawings

Drawings, showing mechanical parts, electronic schematics and PCB component layouts.

8. Technical Notes

Insert all **technical notes** available on this instrument or private notes.

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1. General Information

Read me!

The interface of the Ion Analyser has been specially designed to clearly guide you through every step of the programming and running of the analyses, whether you are a supervisor or a routine user.

An important part of this interface is to check and control the presence of different elements necessary to run the defined application.

Working in Supervisor mode

When programming in **"SUPERVISOR"** mode, it is recommended to work in stages. These stages *should* be carried out in the order described below:

To program a method

1. **Define your electrode(s)**

Identify electrodes (including temperature sensors) to be used for the analysis.

Electrodes can be created from the following lists, Catalogue, Other or Copy from. When creating the electrode, define if electrode calibration is required (or not), if yes specify the "periodicity" of the calibrations and the standards to be used.

2. **Create a new method or Edit a pre-programmed one**

Create the measurement method to be used for the analyses. Enter the parameters required to calculate the results.

When you have finished programming, select the method or the preprogrammed application, refer to Short-Form Reminder no. 2.

If a sample changer is to be used, define the sample changer in the Configuration menu before selecting `Working mode = SAC` sequence in the main window.

3. Check icons

The following icons indicate the exact state of your working system.

Sunny icon:

Everything is OK. Run the method or sequence.

Sunny icons are required to run the method.

Cloudy icon:

Action required within 12 or 24 hours. For example an electrode calibration.

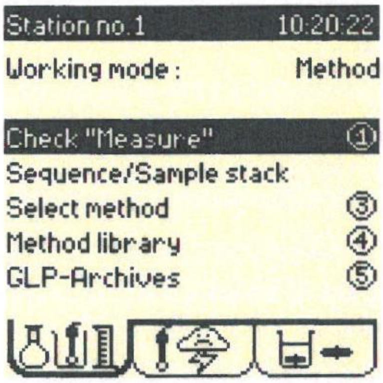
Stormy icon:

Electrode calibration date elapsed or electrodes not installed.

Question mark:

It is a programming error, electrodes are not defined in the selected method. Revise the method programming.

Refer to the Electrode window.



Station no.1 10:20:22

Working mode : Method

Check "Measure" ①

Sequence/Sample stack

Select method ③

Method library ④

GLP-Archives ⑤

When Cloudy/Stormy/Question mark icons appear, Press 1 "Check". The Ion Analyser will automatically guide you through the operations necessary to solve the errors encountered.

4. Running methods

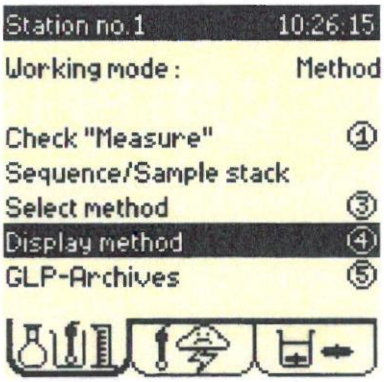
To run a method or sequence, refer to Short Form Reminder no. 4 or 5.

Working in Routine mode

In **"ROUTINE"** mode you are guided at every step, thanks to the clear-text messages and the icons present on the large graphic display.

Access methods

A Routine operator has access to all the displays for *checking* purposes.



Station no.1 10:26:15

Working mode : Method

Check "Measure" ①
Sequence/Sample stack
Select method ③
Display method ④
GLP-Archives ⑤

Running methods

When working in **"ROUTINE"** mode, it is necessary to install your measurement system according to the selected method or sequence, prior to running a method or sequence.

1. Select the method or sequence

Refer to chapter 4.

2. Check icons

The following icons indicate the exact state of your working system.

☀ **Sunny icon**:

Everything is OK. Run the method or sequence.

Sunny icons are required to run the method.

⛅ **Cloudy icon**:

Action required within 12 or 24 hours. For example an electrode calibration.

⛈ **Stormy icon**:

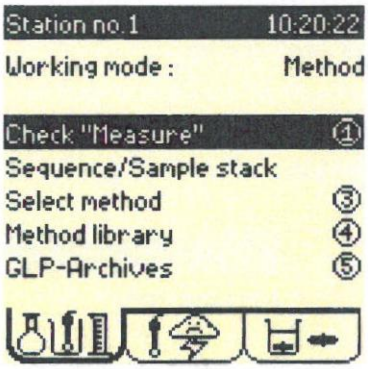
Electrode calibration date elapsed or electrodes not installed.

? **Question mark**:

It is a programming error, electrodes are not defined in the selected method. Revise the method programming.

Refer to the Electrode window.

When Cloudy/Stormy/Question mark icons appear, press 1 to run the "Check" command.



Station no.1 10:20:22

Working mode : Method

Check "Measure" ①

Sequence/Sample stack

Select method ③

Method library ④

GLP-Archives ⑤

Depending on the icons displayed, the Ion Analyser will automatically guide you through the steps necessary to run the analysis, see below.

a. **Connect/install the electrode(s)**

Connect/install electrodes and temperature sensors.
Refer to Short Form Reminder no. 1.

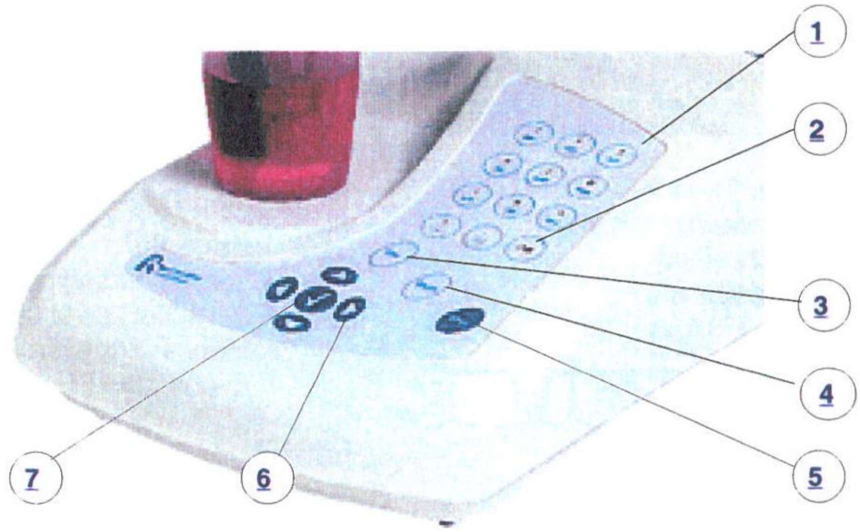
b. **Calibrate electrode(s)**

Run the electrode calibration. Refer to Short Form Reminder no. 3.

d. **Run the method or the sequence, when a Sunny icon is displayed**

Refer to Short Form Reminder no. 4 or no.5.

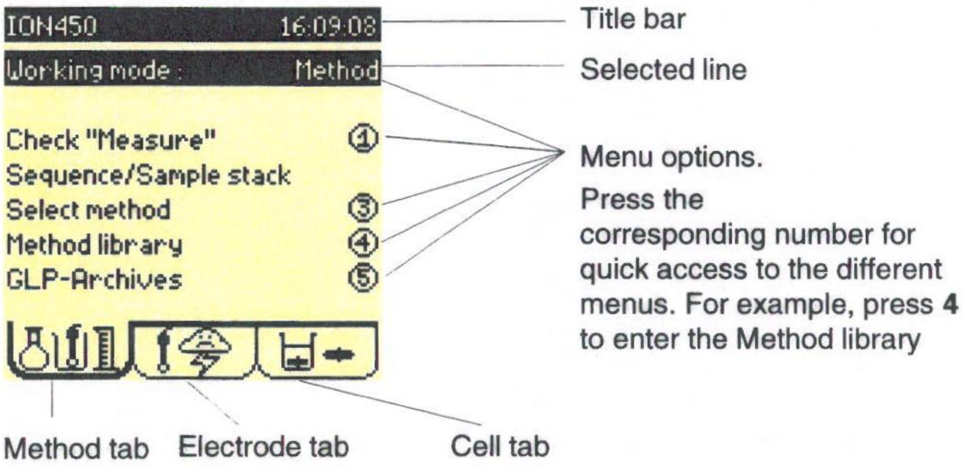
Keyboard



1. Alphanumeric keypad to enter data and parameters on the same principle as mobile telephones. These keys can also be used for quick access to the different menus; refer to the display on the following page.
2. **Del**: deletes the character on which the cursor is positioned.
3. **Esc**: returns to the previous screen. During analysis, this key allows you to enter the method, electrode and cell menu.
4. **Print**: prints the data concerning the screen displayed.
5. **Stop**: stops an analysis. Press this key for 3 seconds in the Main window to gain access to the setup parameters.
6. RIGHT, LEFT, UP, DOWN arrow keys are used to move to different options within the menus.
7. ✓: confirms a data entry, a message or a function asked for by the user.

Basic principles

When the instrument is switched on, the Main window is displayed. When the instrument is switched on for the first time the screen will be as follows:



Title bar

Selected line

Menu options.

Press the corresponding number for quick access to the different menus. For example, press **4** to enter the Method library

Method tab Electrode tab Cell tab

If required, you can adjust the contrast of the display by:

- pressing **0** to increase the brightness,
- pressing **7** to decrease the brightness.

The title bar in the menu indicates the instrument name and the actual time. You will be shown how to personalise the name and adjust the time further on in the manual.

The RIGHT and LEFT arrow keys allow you to move from one tab to the other and enter the `Electrode` and `Cell menus`.

- Work your way through the 3 tabs, then back to the Main window.

The UP and DOWN keys allow you to select a line. To enter an option, select the line, and press ✓. You can also press the corresponding numerical key.

1. Press **4** or select the line Method library and press ✓ to enter the Method library screen. Press **Esc** to return to the Main window.
2. Select the line `Working mode` and press ✓. The following options are available:

   Method: to run a single method.

   Sequence: to create or run a sequence of methods. Beakers are manually changed between two method runs.

   SAC Method: to run a single method to be performed using a sample changer.

   SAC Sequence: to create or run a sequence of methods to be performed using a sample changer.

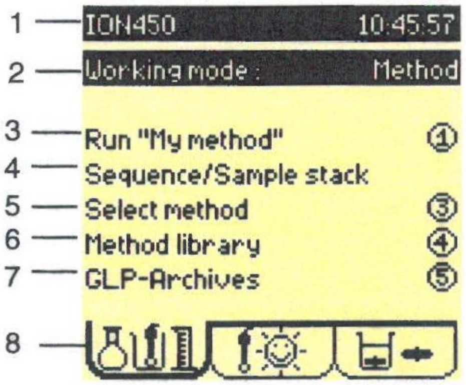
Note: the working mode selected will have no effect on the type of method you wish to create.

Do not forget to define the sample changer in the Configuration menu before selecting SAC Method or SAC Sequence.

3 Press ✓ to confirm your selection.

Main window

When the instrument is switched on the Main window is displayed.



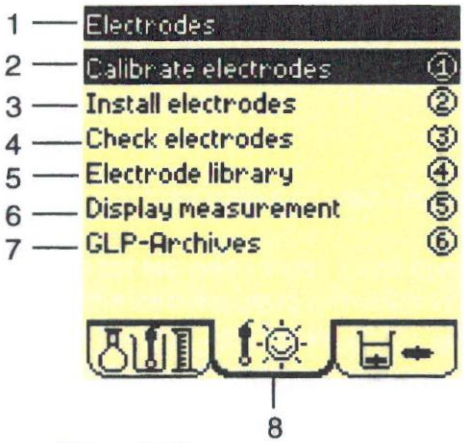
ION450 10:45:57

Working mode : Method

1. **Title bar**: indicates the instruments name and the current time.
2. **Working mode**: Select the way in which you want to work. Choose from Method, SAC Method, Sequence, SAC Sequence ; refer to previous page.
3. **Check** or **Run**: check or run the selected method /sequence. The method can be run when a sunny icon is displayed in the Electrode tab.
   If a cloudy/stormy icon is displayed, activate the "Check" command. The Ion Analyser will automatically guide you through the necessary operations required to solve the problem(s).
4. **Sequence/sample stack**: if `SAC Sequence` or `Sac Method` has been selected in step 2 above. Program the sample stack. Select or edit the method sequence.
5. **Select method**: select method to be used for the analyses.
6. **Method library**: supervisor use only: create, edit, reset and delete methods to correspond to your specific needs.
   Or **Display methods -** routine use only : display the main parameters of the selected method.
7. **GLP-Archives**: access GLP tables and visualise the stored method sample results.
8. **Method tab**: Animated icon indicates when a method/sequence is running.

Electrodes window

Use the **RIGHT** arrow key to move to this window.


1
2
3
4
5
6
7
8
Electrodes
Calibrate electrodes ①
Install electrodes ②
Check electrodes ③
Electrode library ④
Display measurement ⑤
GLP-Archives ⑥

1. **Title bar**: indicates the name of the window.
2. **Calibrate electrode**: run a calibration or a calibration sequence using the installed electrodes.
3. **Install electrodes**: connect, disconnect or replace electrodes in a method or sequence.
4. **Check electrodes**: check the identification parameters of the electrodes used in the method or sequence.
5. **Electrode library** - Supervisor use only: create, edit, reset and delete electrodes stored in the instrument.
6. **Display measurement**: displays mV and/or pH and/or concentration and/or conductivity and/or temperature at a connected electrode of the electrode system.
7. **GLP-Archives**: access GLP tables and visualise the stored electrode calibration results.
8. **Electrode tab**: Electrode status icon indicates the state of the electrode system. Four types of icons can be displayed.

Sunny icon.
The calibration has been performed on all the electrodes present in the system. Everything is just right!

Cloudy icon.
The electrode calibration of one of the electrodes present in the system should be performed within 12 or 24 hours.

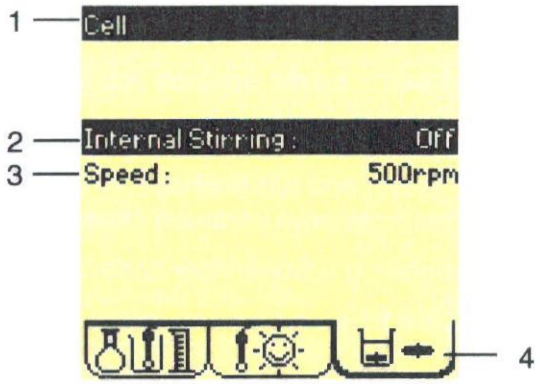
Stormy icon.
The calibration date has elapsed for one of the electrodes present in the system.
If acceptance limits have been set for the calibration: at least one calibration result lies outside the programmed acceptance limits.
At least one of the electrodes present in the system has not been installed.
Check the sequence or method, (press **1** in the Main window). The instrument prompts you to do the necessary operations. You are guided step by step.

Question mark.
There is a problem in the editing of the electrode system. You need to be in Supervisor mode to solve the problem. Check the sequence/method or electrode parameters.

Check the sequence or method, (press **1** in the Main window). The instrument indicates the possible errors and prompts you to correct them until **?** disappears.

Cell window

Use the **RIGHT** arrow key to move to this window.



Cell

Internal Stirring : Off

Speed: 500rpm

1. **Title bar**: indicates the name of the window.
2. **Internal stirring**: command stirrer On/Off.
3. **Speed**: select the internal stirring speed, from 100 to 1100 rpm by steps of 50 rpm.
4. **Cell tab**: animated icon indicates when the magnetic stirrer or propeller is operating.

Apply internal stirring

1. Select `Internal stirring = ON`,
2. Press ✓ in the field `Speed` and select a stirring speed.

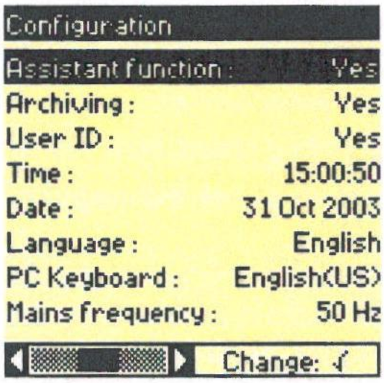
Apply external stirring

1. Connect the Stirring Propeller, part no. 847-731, to the Ion Analyser **Propeller** socket. Line 3 is automatically replaced by `External stirring`.
2. Select `External stirring = ON`.
3. Adjust stirring by turning the stirring propeller knob. You can consult the corresponding table between the position (1 to 9) and the stirring speed by pressing ✓ in the field `Speed setting`.

System configuration

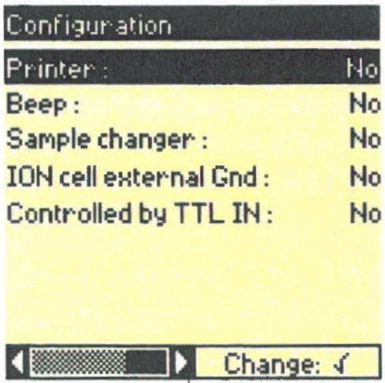
Proceed as follows to configurate your workstation

1. Press **Stop** for 3 seconds in the Main window to enter the Setup menu.
2. Supervisor code:
   Entering a `Supervisor code` enables you to differentiate between the 2 operator modes: Routine and Supervisor:
   In Routine mode, the user is able to select and run methods. In Supervisor mode, the user can create, edit, select and run methods. A Supervisor code is also used to protect your parameters from any unwanted changes.
   - Continue without entering a Supervisor code.
3. Press **1** to enter the `Configuration` menu.



Assistant function : Yes
Archiving : Yes
User ID : Yes
Time : 15:00:50
Date : 31 Oct 2003
Language : English
PC Keyboard : English(US)
Mains frequency : 50 Hz

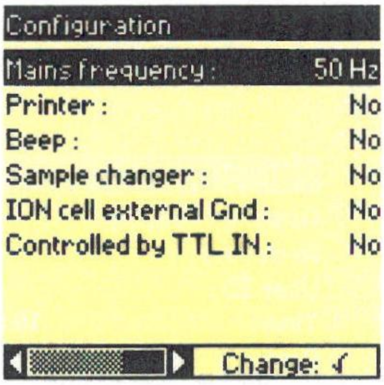
4. Press the RIGHT arrow key.



Printer : No
Beep : No
Sample changer : No
ION cell external Gnd : No
Controlled by TTL IN : No

The position of the bar indicates the last screen in the `Configuration` menu.

5. Press the UP arrow key.



Configuration

Mains frequency : 50 Hz

Printer : No

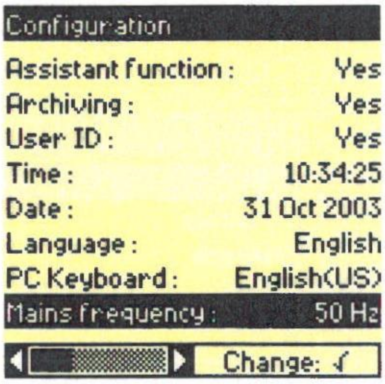
Beep : No

Sample changer : No

ION cell external Gnd : No

Controlled by TTL IN : No

6. Press the LEFT arrow key to return to the first screen in the `Configuration` menu.



Configuration

Assistant function : Yes

Archiving : Yes

User ID : Yes

Time : 10:34:25

Date : 31 Oct 2003

Language : English

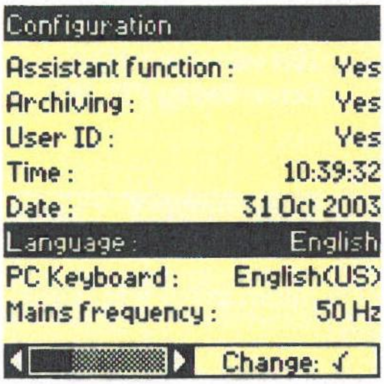
PC Keyboard : English(US)

Mains frequency : 50 Hz

Choosing the language

Choose your language for displays and printouts in the following way:

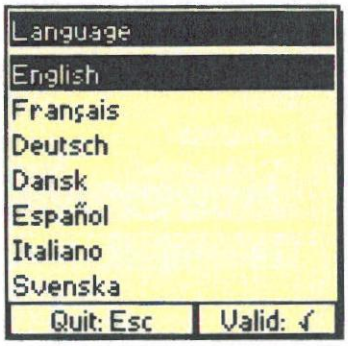
1. Use the UP and DOWN arrow keys to select the Language line.
2. Press ✓ to change a parameter as indicated at the bottom of the screen.



Configuration

Assistant function : Yes
Archiving : Yes
User ID : Yes
Time : 10:39:32
Date : 31 Oct 2003
Language : English
PC Keyboard : English(US)
Mains frequency : 50 Hz

3. Select the language.



Language

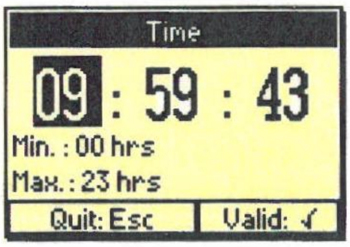
English
Français
Deutsch
Dansk
Español
Italiano
Svenska

Esc allows you to leave the screen without changing the language.

Setting the date and time

The current date and time are entered in the following displays:

1. Select `Time`.


Time

09 : 59 : 43

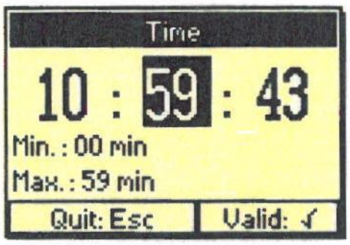
Min. : 00 hrs

Max. : 23 hrs

Quit: Esc
Valid: √

Enter the hours (from 00 to 23).

2. RIGHT arrow key.


Time

10 : 59 : 43

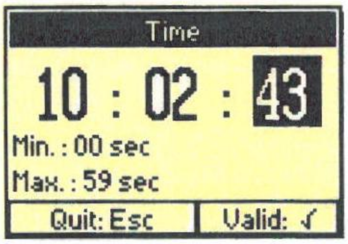
Min. : 00 min

Max. : 59 min

Quit: Esc
Valid: √

Enter the minutes (from 00 to 59).

3. RIGHT arrow key.


Time

10 : 02 : 43

Min. : 00 sec

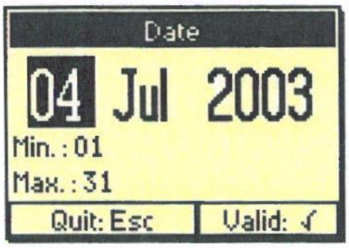
Max. : 59 sec

Quit: Esc
Valid: √

Enter the seconds (from 00 to 59).

The LEFT arrow key allows you to return to the previous screen to modify an entered value.

4. Press ✓ to confirm (as indicated on the screen).
5. Select `Date`.


Date

04 Jul 2003

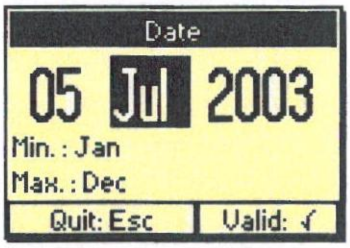
Min. : 01

Max. : 31

Quit: Esc
Valid: √

Enter the day (from 00 to 31).

6. Press RIGHT arrow key.



Date

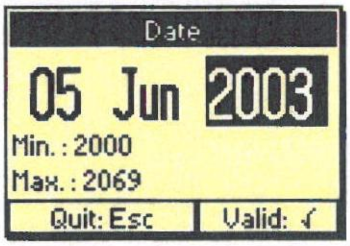
05 Jul 2003

Min. : Jan

Max. : Dec

Quit: Esc | Valid: √

7. Press RIGHT arrow key.



Date

05 Jun 2003

Min. : 2000

Max. : 2069

Quit: Esc | Valid: √

Enter the year (from 2000 to 2069).

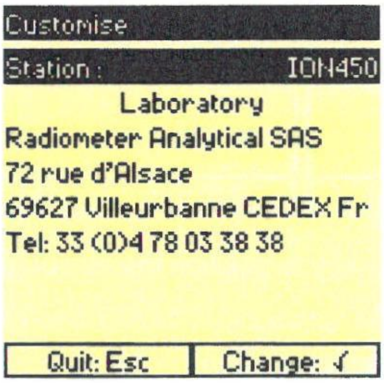
8. Press 3.

Customising the workstation

You can assign a name to your workstation, which will be permanently displayed in the title bar of the Main window. Typing the name will allow you to get used to using the instruments keypad.

1. Before leaving the `Configuration` menu:
    - Select `PC keyboard`,
    - select `English (US)`.

   This allows you to use a QWERTY keyboard.
2. Press **Esc** to return to the `SETUP` menu.
3. Press **3** (`Customise`).

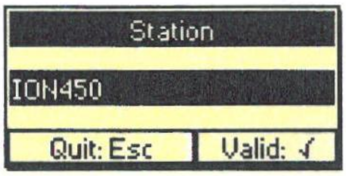


Customise

Station : ION450

Laboratory
Radiometer Analytical SAS
72 rue d'Alsace
69627 Villeurbanne CEDEX Fr
Tel: 33 (0)4 78 03 38 38

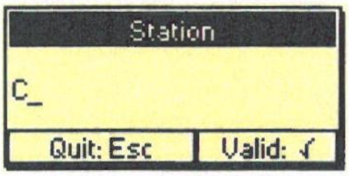
4. Press ✓ to select the `Station` parameter.



Station

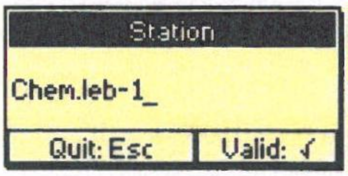
ION450

5. To replace "ION450" by "Chem.lab-1", proceed as follows:
   - Press **7** until the letter "C" appears, then release the key. The cursor moves to the next position.

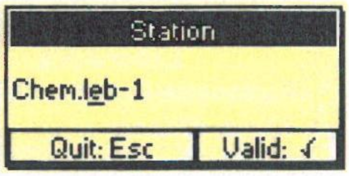

Station
Quit: Esc
Valid: √

C_

   - Press 9 until the letter "h" appears.
   - Continue until you have entered (em.lab-1).
   - To correct a typing error, proceed as follows:

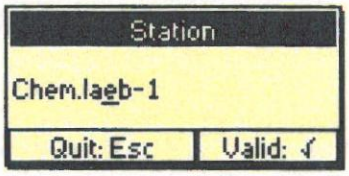

Station
Quit: Esc
Valid: √

Chem.leb-1_


Station
Quit: Esc
Valid: √

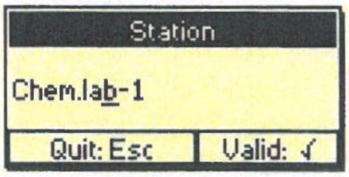
Chem.leb-1

Press the LEFT arrow key to position the cursor on the letter "E". Press 7 to enter the letter "A".


Station
Quit: Esc
Valid: √

Chem.laeb-1

The letter E has been inserted between the letter "A" and the letter "B".

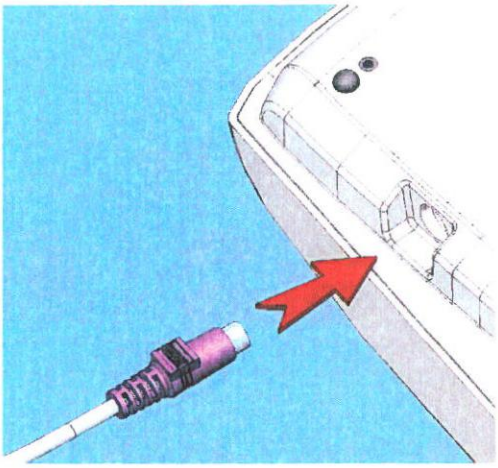

Station
Quit: Esc
Valid: √

Chem.lab-1

Press **Del** to delete the "E".

   - Press 3 to confirm the entry.

6. You can also use a PC keyboard to enter alphanumeric characters.
   - Connect the PC keyboard to the 6-pin plug situated on the left hand side of the instrument.

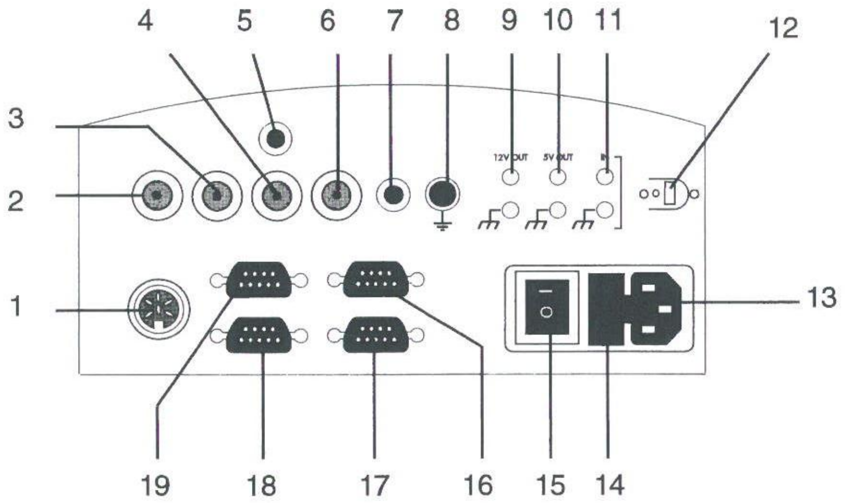


   - Select the line `Radiometer Analytical`. This line is used to enter information concerning the workplace, user(s) name(s), location, address etc.
   - Enter the text using the PC keyboard (maximum of 32 characters can be used). If the characters shown on the display do not correspond to the ones typed on the keyboard, redefine your keyboard type. To do this, press **Esc** then **1** and select `PC keyboard`.
   - Press ✓ to confirm.

You have now finished the getting started section. Press **Esc** to leave the `Customise` screen, then press **5** to quit the SETUP menu.

Input/outputs

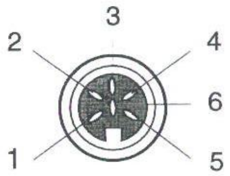
Rear panel



1. Conductivity cell

6-pin DIN socket for connection of the conductivity cell with 2, 3 or 4 poles and a temperature sensor.

Pin layout:



Pin 1 : pole no.1
Pin 2 : pole no.2
Pin 3 : pole no.3
Pin 4 : pole n°4, also connected to pin no. 5
Pin 5 : 0 V (ground)
Pin 6 : temperature sensor

Potential imposed between poles 2 and 3: ±200 mV constant for all conductance ranges.

The current passing through poles 1 and 4 is measured. The potential between poles 1 and 4 cannot exceed 3 V in absolute value.

2 and 3. E1 AND E2

Set of 2 BNC sockets to connect an indicating electrode (pH, Redox or ion-selective). This electrode can be single or combined including a reference part. The shielding of the sockets **E1** and **E2** are connected to the **Ref** input electrodes.

4 and 5. REF

BNC coaxial socket to connect a reference electrode.

The pin layout of this socket is shown in the section Connection of peripherals.

6. Pt-Pt

Coaxial BNC socket to connect a double metal electrode.

The shielding of the **Pt-Pt** is made via the instrument's ground. The socket core can be polarised using AC or DC (±1 mA) current or using AC or DC voltage (± 2000 mV).

7. TEMP

CINCH socket to connect a temperature sensor.

8. GND

Ground socket. The shielding of the GND socket is made via the instrument's ground. This socket is mainly used to ground a solution.

9, 10 and 11. TTL

3 sets of 2 banana sockets. 1 auxiliary input IN and 2 auxiliary outputs 5 V OUT and 12 V OUT. Use a 2 mm diameter banana plug in each socket.

The auxiliary input can be used to send a command to the TIM for an external titration start. The banana socket receives a signal TTL 0 ±5 V or 0 ±12 V and the black banana socket is to connect the instrument's electric zero.
Impedance input: 10 KOhm.

The auxiliary outputs are used to command peripherals (e.g. electrovalves) during a measurement. These commands can be programmed during method editing.

The red banana sockets send a signal TTL 0 ±5 V (+2,5 mA/-5 mA) or 0 ±12 V (+6 mA/ -12 mA) and the black banana sockets are connected to the instrument's electric zero.

12. STIRRER

Connect 2-way control stirrer. Power requirements: 12 V, 200 mA max.

13. MAINS SUPPLY

3-pin socket. Use one of the line cords, 230 V (A95S001) or 115 V (A95S002) supplied to connect the Titration Manager to the mains.

Fuse holder, containing 2 slow blow fuses, type T1A L250V.

14. Main fuse

Pull out the drawer to change the main fuse. Use only the same rate as described in the specification.

15. ON/OFF Switch

16. SAC80/90

RS232C serial port, to connect a SAC80/SAC90 Sample Changer.

17. SLAVE

Not used.

18. PC/PRINTER

Used for downloading embedded software with the FlashLoader software.

RS232C serial port, for PC or printer connection.
The pin layout of this socket is shown in section 7 "Connection of peripherals".

19. AUX

Used to update the P89C51Flash PROM circuit with the Philips software.

No additional instrument must be connected to the socket.

Electronic and mechanical specifications

Main board

A/D Sigma Delta 22 bit converter.

3 RS232 communication ports.

Real time Clock component programming.

20 key front keyboard input control.

PC keyboard connection input.

P89C51RB2 Micro controller (8051 CPU core, 16 Kbyte Flash, 1KByte RAM, PCA, 12 MHz, 6 cycle clock).

Graphic LCD hardware control: Varitronix MGLS128128 or Densitron; LED backlight

Digital contrast control.

Software controlled buzzer.

Software controlled +12 VDC and +5 VDC logic output.

TTL input +12 VDC acceptable.

Analogue, mechanical commands

Electrode input analogue measurement and analogue to digital conversion.

Valve and piston position detection. Burette piston, stopcock valve motors control.

Pump motor control, presence detection.

Stirrer control.

External stirrer control with presence detection.

Power supply

10 years minimum RAM safety power battery.

From switching power +15 VDC output, +12 VDC (Fan) , +5 VA (Analog), +8.2 V (Analog).

From switching power -15 VDC output, -6 VA (Analog and RS232), -8.2 V (Analog switches), -5 V (RS232).

CPU Board

i386EX micro controller.

25 MHz internal clock

1 Mbyte flash memory RAM.

1 Mbyte static RAM.

Reset controller

2 RS232 communication ports.

Power supply module

Installed under the main board and protected by a cover, the switching power supply module provides 3 regulated voltage supplies: +5 V, +15 V and a -15 V.

Acceptable input voltages are between 90 and 264 VAC, 47 to 63 Hz without any physical modification to the instrument.

+ 15 VDC is used for Burettes and stirrer motors

+ 5 VDC is used for the PC key board, the P043 and Mother logic boards.

-15 VDC is used for the -6 VDC on the main board.

The Fan

- Mounted on a plate near the switching power supply, a +12 VDC fan cools down the electronic system

Stirrer unit

- Consists of a motor and a magnetic rotor assembly mounted on a plate.

Front panel

- Consists of a LED backlit graphic screen, 128*128 dots.
- A flat keyboard

Technical specifications

Potentiometric Methods

pH electrode calibration:

- Up to 5 points using IUPAC standards or 4-7-10 Series buffers with error recognition on buffer used.
- Possibility to work with user defined buffer values using the Free buffer mode.

pH with temperature-compensated reading: Probe, entered or fixed at 25°C.

Direct pH/mV measurements with recording on stable reading.

Sequencing of up to 10 methods including electrode calibrations.

Coupling of 2 to 6 methods in one beaker, including direct ISE and EC measurements.

Conductivity Methods (EC)

Direct conductivity measurements with recording on stable reading.

Conductivity with temperature-corrected display: None, natural water (ISO 7888), linear.

Conductivity cell cable resistance compensation.

Conductivity cell calibration: Manual cell constant entry or automatic determination using 1, 0.1, 0.01 Demal KCl standards, NaCl 0.05%, 26.6 µS/cm at 20°C low conductivity standard, 0.1, 0.01 and 0.001 M KCl standard.

Possibility to work with user defined standard values using the Free buffer mode.

Ion Selective Methods (ISE)

ISE measurements using direct measurements with recording on stable reading.

Electrode calibration with up to 9 standard solutions.

Electrode calibration curves fitted using non-linear regression with C0 detection limit determination according to IUPAC.

Curve plotting: mV = f(pC) for ISE calibration.

Printout

Automatic. GLP compliant.

Selectable: no, 80 columns, continuous, page to page.

3 levels of detail.

Laser or dot matrix printer.

Outputs

Sample changer	Yes
Balance	No
Printer	Yes
PC software	Yes
Peristaltic pump/TTL connections	Yes
PC keyboard and bar code reader	Yes
0-5 V; TTL	1
0-12 V; TTL	1

Inputs

Indicator electrode:	2
Reference electrode:	1
Selectable polarised input:	±1 mA in 1 µA steps, DC or AC
Additional electrode inputs:	No
Differential measurement:	Yes, 1 ground input
Temperature input:	1
Imposed current:	±1 mA ±1 µA
2/4 pole conductivity cell:	1
0-5 V TTL:	1

Sample list

Number of samples:	Series up to 126 samples with alphanumeric ID
QC sample definition:	Yes

Units

All standard units for samples/results.
Conductivity: µS/cm or mS/cm.

Results

QC check on results with visual warning:	Yes
Statistical calculations:	Yes
Automatic GLP printout:	No

Storage capacity

Pre-programmed methods:	Yes
Global password protection:	Yes
Non-volatile memory:	Yes
User-programmable methods:	50 including preprogrammed methods
Electrode library:	30 including pre-programmed electrodes
Pre-identified electrodes:	A catalogue of up to 30 electrode names and characteristics
Results storage:	Up to 200 sample results. Results storage can be disabled. 100 electrode calibrations

Electrode stand/stirring

Magnetic stirrer:	22 reproducible speeds (0 to 1100 rpm) in 50 rpm steps.
Propeller stirrer connection:	Yes
Beaker volume:	5 to 400 ml

General specifications

Languages: English, German, Danish, French, Italian,Spanish, Swedish.

Casing: Fully splashproof KYDEX® T (PVC/acrylic).

Display: Graphic 128x128 dot LCD and alphanumeric keypad.

Dimensions (HxWxD): 260 x 200 x 400 mm

Weight (exc.cell):2.5Kg

Power requirements: 47.5-63 Hz; 115/230 Vac +15 -18%

Fuse requirements:

2 main fuses: slow blow T1A L250V.
1 secondary fuse: F4A/250V.

Environmental conditions:

Ambient temperature: 5 to 40°C.
Relative humidity: 20 to 80%.
Level of pollution: level II
Transitory overvoltage: level II

International standards:

CE marking: Complies with EMC directive 89/336/EEC, LV directive 73/23/EEC.

Metrology

Calibration and verification certificates.

Can be done by our COFRAC accredited laboratory. It produces pH and conductivity standards with certificates of traceability and conformity.

International standards

The ION450 complcomplies with the following standards:

EMC Directive (89/336/EEC)

Class A equipment for laboratory use, according to the standard EN 61326-1.

Emission:

EN 55011
EN 61000-3-2
EN 61000-3-3

Immunity:
EN 61000-4-2 level 2 & 3
EN 61000-4-3 level 1
EN 61000-4-4 level 2
EN 61000-4-5 level 2
EN 61000-4-6 level 2
EN 61000-4-11

Low Voltage Directive (73/23/EEC)

The ION450 complies with the following standard:

Reference standard: EN 61010-1.

Standard applied:

Standard for Electrical Equipment for Laboratory use: UL 61010A - 1

Standard for Safety Requirements for Electrical Equipment for measurement, Control and Laboratory use: CAN / CSA C22 2 N° 1010.1 - 92.

2. Service Information

Warranty and Service policy for ION450

ION450 Warranty

The ION450 carries a 1-year warranty against defective materials or workmanship, one year from the date of shipment.

The warranty obligations are limited to the replacement of defective parts of the product and do not cover any associated cost and expenses.

The warranty obligations are not applicable to products used in a highly corrosive or aggressive atmosphere, requiring special protection or environment or to products having suffered due to transport or used in conditions other than recommended by the manufacturer.

Radiometer Analytical does not warrant against any damage caused by auxiliary equipment or installation connected by a physical or electronic or optical connection to our product.

ION450 Service policy

Replacement of parts:

The ION450 electronic set-up consists of 1 main electronic board with connections to the rear panel, a switching power supply module, the keyboard and the LCD display, which are interconnected. The mechanical part of the ION450 consists of a stirrer assembly and a fan. As they are dedicated to a specific function, it is easy to localise from which module the fault might come. Therefore, our service policy for the ION450 consists of replacing any of the electronic modules or mechanical assemblies that happen to be faulty.

No repair at component level of the surface-mounted electronic boards must be carried out, except for some traditional components, connectors, etc., which are found to be defective. The exchange replacement system applies to the ION450 electronic boards during the warranty period.

Numerous subassemblies or specific components are available as service parts to repair the ION450 mechanical modules. The exchange replacement system does not apply to such modules.

Return of defective parts for credit:

Defective parts of ION450 under our warranty must be returned to us so that the corresponding credit note can be issued. In parallel, the replacement parts must be ordered by the distributor. For instruments under warranty, you must always get a Return Authorisation Number from your Area Sales Manager or the Service Specialist prior to your shipment. See the instructions for returning goods. No credit will be accepted for parts out of warranty.

Return for repair:

It is possible to return the ION450 unit for repair at our premises if you fail to localise the fault or when no spare parts are available immediately. For instruments under or out of warranty, you must always get a ***Return Authorisation Number* from your Area Sales Manager or the Service Specialist prior to your shipment. See the *instructions for returning goods.***

Precautions for exchanging parts

The following precautions must be observed when servicing the ION450.

Observe proper ESD precautions: The circuit set-ups can be damaged or destroyed by ELECTROSTATIC DISCHARGE (ESD). To ensure optimum, reliable service, it is necessary that technical support personnel discharge themselves by periodically touching the chassis ground prior to the handling of set-ups liable to ESD. This procedure is very important when handling or touching the printed circuit boards.

PCBs should be handled or transported in the same electrically conductive plastic bags as shipped in to ensure optimum protection against ESD damage.

Exchanging parts

The following instructions describe the way to dismount a part or module. When remounting a new part, follow the procedure in reverse order.

Never pull out any connector by holding the wires. Irremediable damages may be caused to connections.

Before working in the instrument, disconnect the main power cord and ensure the switching power supply is completely discharged.

Opening the instrument.

Remove the metal rod.

Disconnect everything from the rear panel.

Turn the instrument upside down and remove the 4 screws (4). See the drawing in this section

Remove the bottom casing.

Turn the instrument the right way round.

The switching power supply

Open the instrument.

Remove the 4 screws (1) which hold the power supply board protection and the switching power supply module. See the drawing in this section.

From the board, disconnect the input connector (2 pin) and the output connector (6 pin).

Exchange the module.

The fan

- Open the instrument.
- Unscrew the 4 screws (2) holding the fan and power supply plate.
- Disconnect the fan connector
- Pull out the wires from the connector.
- Unscrew the 4 screws (3) to remove the fan.
- Exchange the fan. The air flow must goes from the board to the bottom of the instrument.
- Insert the fan wires in the connector as they were fitted previously: Black to pin 1 and red to pin 2. See the main board components layout in section 7

The keypad

Open the instrument.

Pull out the keyboard connector.

Remove the keypad from the instrument casing.

Clean the casing with methanol before fitting the new key pad.

Warning!!:

- Do not peel of the paper protection behind the key pad connector before passing the flat cable in the casing hole.
- If inadvertently the flat cable is sticking on the rear face of the keypad, the connections will irremediably be destroyed.
- There is no warranty for this problem on a keypad

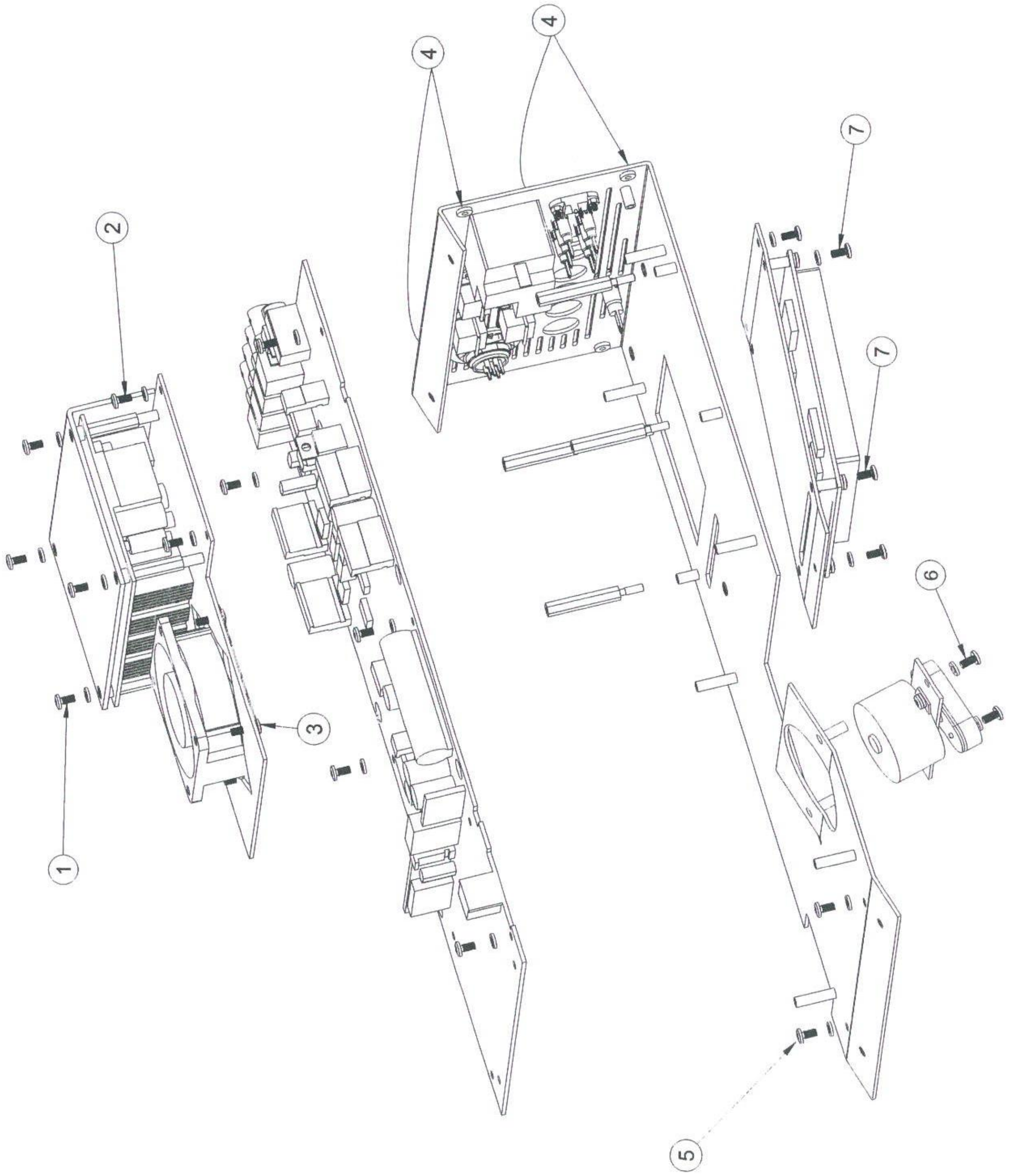
The main board

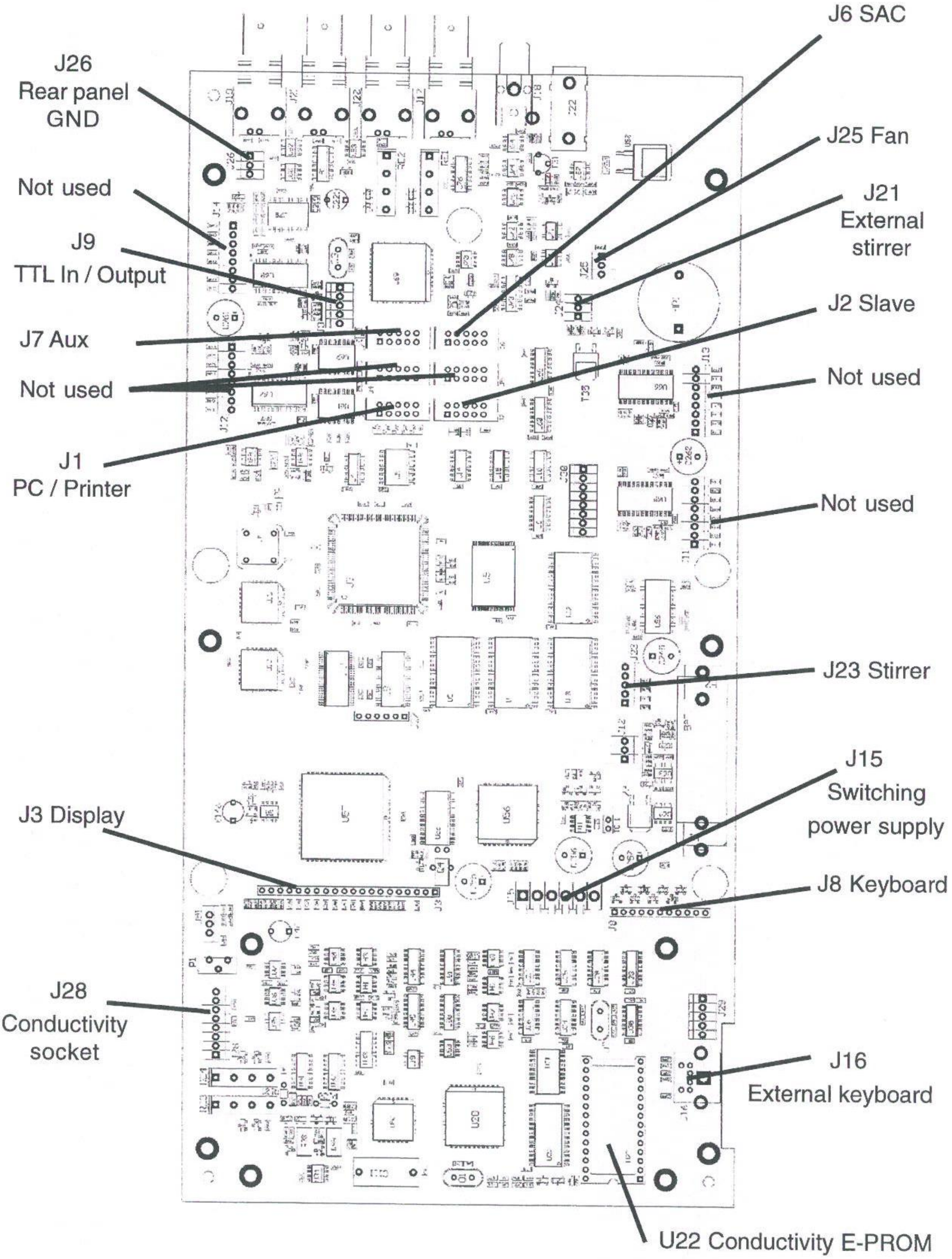
Imperatively, run the "Analog calibration procedure" after exchanging this board See section 4.

- Open the instrument.
- Unscrew the 4 screws (2) holding the fan and power supply plate.
- Disconnect the fan connector J25.
- Disconnect the display connector J3.
- Disconnect the key board connector J8.
- Disconnect the stirrer connector J23.
- Disconnect the connector coming from the rear panel "propeller" J24.
- Disconnect the connector coming from the 3 output voltage sockets J9.
- Disconnect the connector coming from the "réf" socket J26.
- Disconnect the connector coming from the conductivity socket J28.
- Disconnect the 4 x RS232 cables from the main board. (Be careful with the 10-pin).
- Unscrew the 6 screws holding the main board to the main bottom plate.
- Move the Conductivity E-PROM U22 from the old board to the new one.

Warning!!:

- When the new board is fitted and the instrument ready to work, proceed imperatively with the Electrode Analog input Calibration procedure. See section 4




J26
Rear panel GND
Not used
J9
TTL In / Output
J7 Aux
Not used
J1
PC / Printer
J3 Display
J28
Conductivity socket
J6 SAC
J25 Fan
J21
External stirrer
J2 Slave
Not used
Not used
J23 Stirrer
J15
Switching power supply
J8 Keyboard
J16
External keyboard
U22 Conductivity E-PROM

Remove the instrument from the casing

Disconnect all electrodes and wires front the rear panel.

Open the instrument. See description at the beginning of this section.

Unscrew the 4 screws (4) localised on the rear panel.

Unscrew the 2 screws (5).

Remove the entire instrument from the casing.

The stirrer assembly

Open the instrument.

Remove the instrument from the casing.

Unscrew the 4 screws (4) holding the switchnig power supply and the fan plate.

Disconnect the stirrer (J23).

Remove the 2 screws (6).

Take a note for the wires position to reinstall the new one in the same place.

The display assembly

Open the instrument.

Remove the instrument from the casing.

Disconnect the display connector J3.

Unscrew the 4 screws holding the screen assembly (7). See drawing in this section.

Pull carefully the long flat cable.

The power switch or the main power socket

Open the instrument.

Remove the instrument from the casing.

Unscrew the 4 screws (4) holding the switching power supply and the fan plate.

Disconnect the fan from the connector J25.

Unsolder the wires from the socket or from the switch.

Pull out the socket you want to exchange.

Cleaning

The instrument requires minimum maintenance. The exterior surface can be cleaned with tepid water and wiped dry with a soft cloth. Never use another solvent unless you have first consulted your Radiometer Analytical representative.

Transporting the instrument

Always use the packaging supplied by the manufacturer.

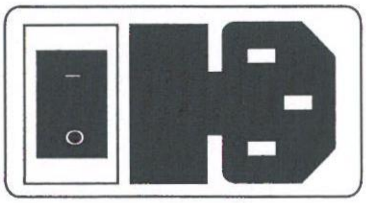
IMPORTANT!

Remove the metal rod before transporting the instrument.

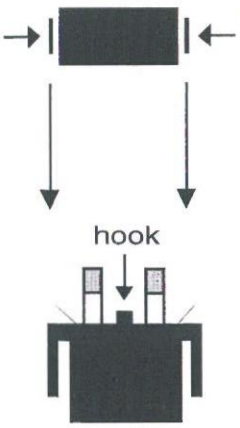
Never pick up or carry the instrument by the metal rod.

To replace the fuses

1. Disconnect line cord



2. Remove the fuse holder



3. Replace the used fuses with ones of the same type and rating

4. Put the cap back in place

FlashLoader Light 3.0 Software

The FlashLoader software is used to download a new embedded software version to an instrument from a diskette or from the Service Manual CDROM.

Warning!!:

- Always download the embedded software using the FlashLoader version coming from the same Service CD-ROM.
- Uninstall any earlier FlashLoader version before installing this new version.

*To uninstall, select **Start > Settings > Control Panel > Add/Remove Programs**.*

Equipment required

You need the following equipment to update the instrument embedded software:

- A serial cable D-9F/2M/D-9F Direct, part no.: A95X501.
- The Service CD-ROM version 2003-03-J at least, part number D51A001, with the FlashLoader version 3.0 and the instrument embedded software.

Procedure to download a new software version in an instrument.

1. Install the FlashLoader software as follows:
    a) Insert your FlashLoader CD into the PC drive.
    b) In the "Start" Windows menu, enter "D:\ Setup" (i.e. your CD drive).
    c) Follow the installation as described in the software.

2. From the Service Manual CR-ROM or from the Radiometer Analytical Resource Centre at http://www.radiometer-analytical.com, run the embedded software command file of your instrument.
   You can also download the command file to a directory of your disc before running it. Running this command file will automatically unzip the files in a dedicated directory of your hard disk (C:\Program Files\FLD)

Warning!

Do not rename nor move this directory and the files it contains!

3. Connect the instrument "PC/PRINTER" socket to a serial port of the computer, using cable, part no. A95X501. Disconnect all other peripherals from the instrument you want to update the embedded software.
4. Connect the instrument to the mains and switch it on.
5. Start the FlashLoader Light software (in the desktop, double-click the FlashLoader Light icon). FlashLoader Light automatically identifies the correct instrument and downloads the correct latest version.

6. Select the computer serial port used for communication with the instrument then ***click*** **OK**.
7. FlashLoader Light saves your current data, if necessary. During this operation, the instrument displays “Data transfer in progress“ and the status bar of FlashLoader Light reads “Saving user data to disk“.
8. At the end of this transfer and when prompted to do so, switch off then on the instrument and click **OK**.
9. FlashLoader Light downloads the new software into the instrument. During this operation, the instrument displays a blank screen and the status bar of FlashLoader Light reads “Downloading program file“.
10. At the end of this download and when prompted to do so, switch off then on the instrument and click **OK**.
11. FlashLoader Light restores your data. During this operation, the instrument displays “Data transfer in progress“ and the status bar of FlashLoader Light reads “Restoring user data“.
12. At the end of this transfer and when prompted to do so, switch off then on the instrument and click **OK**

Uninstalling FlashLoader Light from your PC

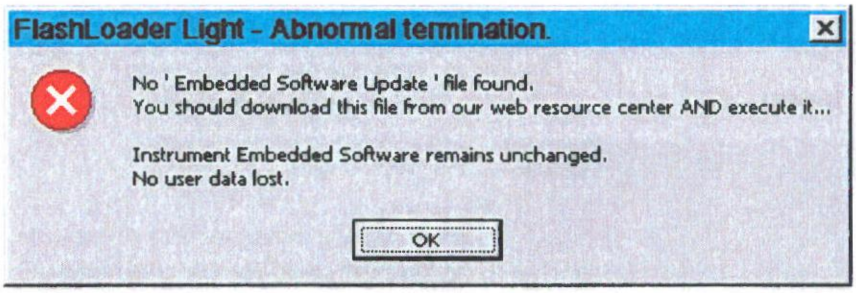
1. Select **Start > Settings > Control Panel > Add/Remove Programs.**
2. Select **FlashLoader Light** then click **Add/Remove**.
   All the files that have been created and copied by the FlashLoader Light setup program are removed from the installation directory. The files that have been created by the setup program are suppressed from the C:\Windows\System directory. The installation directory and program folder are removed if empty.

FlashLoader Light - Troubleshooting guide

The present document lists the problems that you may encounter while updating the embedded software of an instrument using FlashLoader Light. For all that follows:

- "Step no. x" refers to the "Updating the instrument embedded software" instructions of the ReadMe file.
- the word "Instrument" means: ION450.

No embedded software update file found



FlashLoader Light - Abnormal termination.

No ' Embedded Software Update ' file found.
You should download this file from our web resource center AND execute it...

Instrument Embedded Software remains unchanged.
No user data lost.

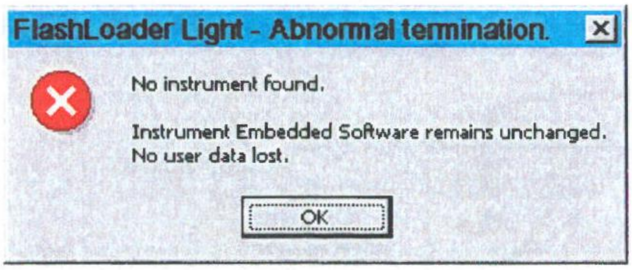
After having selected the computer serial port used for communication.

Nothing has been performed: the instrument embedded software has not changed and your data are still in the ION450.

FlashLoader Light cannot find the unzipped command file.

Run the embedded software command file from the Radiometer Analytical Resource Centre at http://www.radiometer-analytical.com (or from a diskette or a CD-ROM supplied) then restart FlashLoader Light.

No instrument found



FlashLoader Light - Abnormal termination.

No instrument found.

Instrument Embedded Software remains unchanged.
No user data lost.

After having selected the computer serial port used for communication.

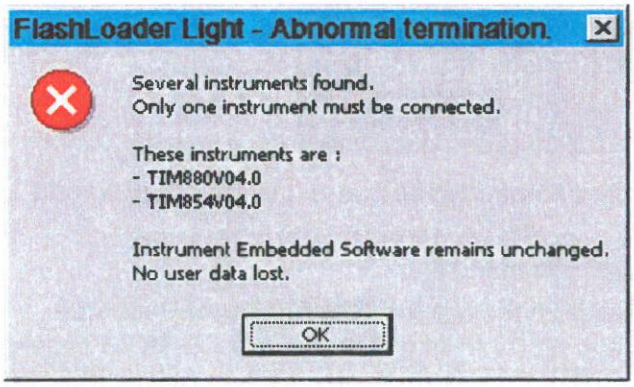
Nothing has been performed: the instrument embedded software has not changed and your data are still in the ION450.

Click **OK**, check the following points of the Troubleshooting list then restart FlashLoader Light.

Troubleshooting list:

- The instrument (socket "PC/PRINTER") should be connected to a serial port of the computer.
- Check the connection and the cable. The Radiometer Analytical C501X cable (part no. : A95X501) should be used for that purpose.
- The computer serial port used for that connection should be the one selected ("Port - COMx" option).
- The instrument must be switched on.

Several instruments found


FlashLoader Light - Abnormal termination.

Several instruments found.
Only one instrument must be connected.

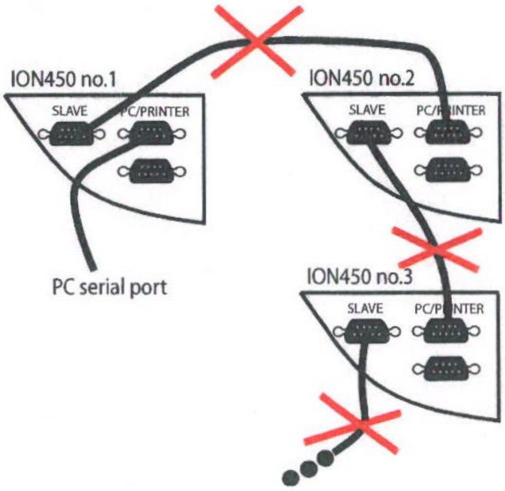
These instruments are :
- TIM880V04.0
- TIM854V04.0

Instrument Embedded Software remains unchanged.
No user data lost.

After having selected the computer serial port used for communication.

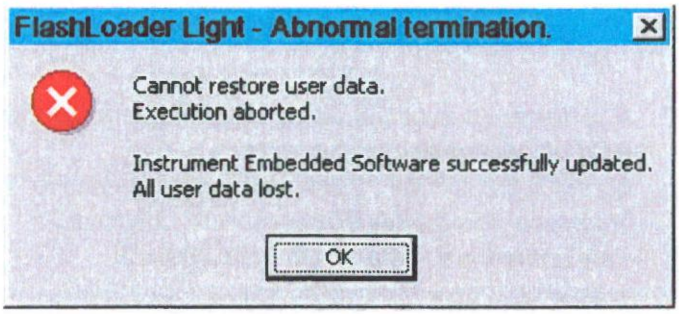
Nothing has been performed: the instrument embedded software has not changed and your data are still in the ION450.

You must connect only one instrument to the PC communication port. This instrument is the one you want to update the embedded software (ION450 no.1 in the example below):



Click **OK**, check the connections then restart FlashLoader Light.

Cannot restore user data


FlashLoader Light - Abnormal termination.

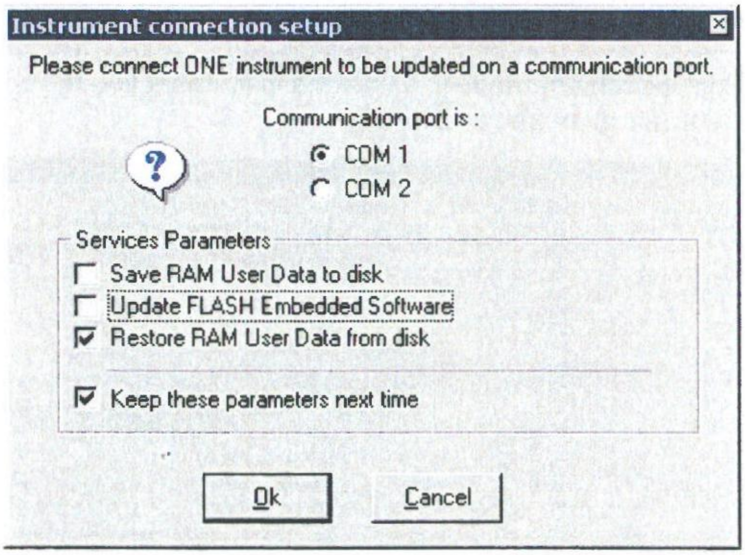
Cannot restore user data.
Execution aborted.

Instrument Embedded Software successfully updated.
All user data lost.

A problem (power failure or disconnection of the PC/ION450 cable) has occurred during execution of "Restoring user data step" (see paragraph "Procedure to download a new software version in an instrument").

Click **OK**. You have updated the embedded software but have lost all your data. Follow the procedure below to retrieve all your data:

1. Switch off then on the instrument and check the connection PC to instrument.
2. Start FlashLoader Light (Start > Program files > FlashLoader Light).
3. Select the computer serial port used for communication and press **CTRL** + **SHIFT** + **S**. Deselect the two first Service parameter options and select the *Restore RAM User Data from disk* option selected as shown below:


Instrument connection setup

Please connect ONE instrument to be updated on a communication port.

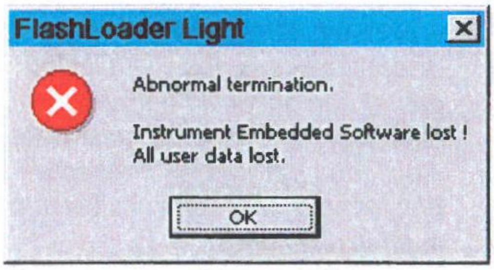
Communication port is :
● COM 1
○ COM 2

Services Parameters
☐ Save RAM User Data to disk
☐ Update FLASH Embedded Software
☑ Restore RAM User Data from disk

☑ Keep these parameters next time

4. Click **OK**. FlashLoader Light restores your data. While doing this, the instrument displays "Data transfer in progress". The FlashLoader Light status bar reads "Restoring user data".
5. At the end of this transfer and when prompted to do so, switch off then on the instrument and click **OK**. You have retrieved all your data (method data, results, status of the system (electrode connections)).

Instrument embedded software lost ! All user data lost ! then the instrument displays a blank screen


FlashLoader Light

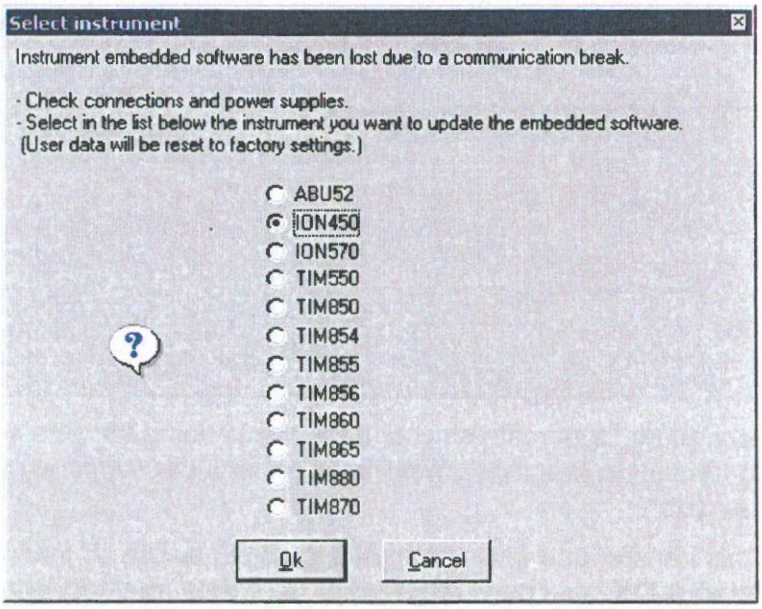
Abnormal termination.

Instrument Embedded Software lost !
All user data lost.

A problem (power failure or disconnection of the PC/ION450 cable) has occurred during execution of "Downloading program file" step (see paragraph "Procedure to download a new software version in an instrument").

When you click **OK** then switch off then on the ION450, the instrument displays a blank screen. You have lost the embedded software and all your data. Follow the procedure below to upload the embedded software and retrieve all your data:

1. Connect the instrument to the mains and switch it on.
2. Connect the instrument "PC/PRINTER" socket to a serial port of the computer (COM1 for example), using cable, part no. A95X501.
3. Start the FlashLoader Light software (Start > Program files > FlashLoader Light).
4. Select the computer serial port used for communication with the instrument then click **OK**.
5. In the Select instrument window, select the instrument you have connected to the PC and click **OK** (for example, a ION450).


Select instrument

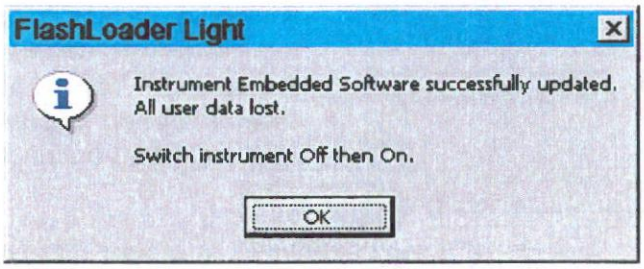
Instrument embedded software has been lost due to a communication break.

- Check connections and power supplies.
- Select in the list below the instrument you want to update the embedded software.
(User data will be reset to factory settings.)

○ ABU52
● ION450
○ ION570
○ TIM550
○ TIM850
○ TIM854
○ TIM855
○ TIM856
○ TIM860
○ TIM865
○ TIM880
○ TIM870

6. FlashLoader Light downloads the new software into the instrument. During this operation, the instrument displays a blank screen and the status bar of FlashLoader Light reads "Downloading program file".

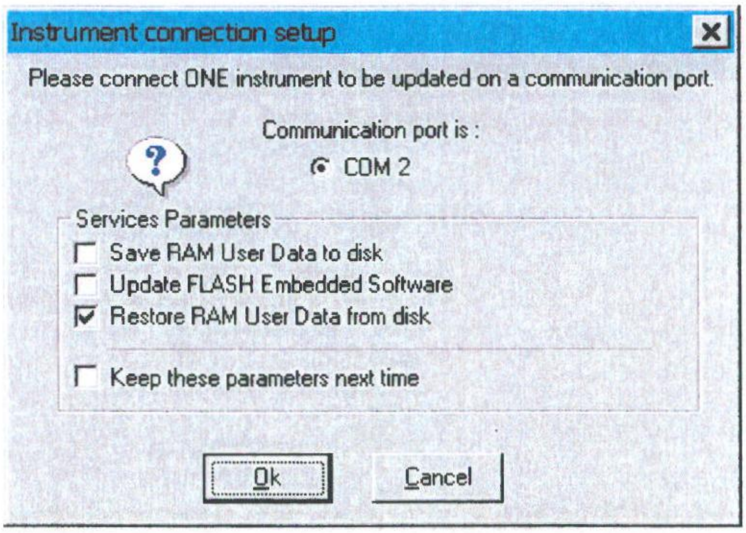
7. At the end of this operation and when prompted to do so, switch off then on the instrument and click **OK**. *You have updated correctly the ION450 software. Now, we are going to restore all your data.*



Instrument Embedded Software successfully updated.
All user data lost.

Switch instrument Off then On.

8. Switch off then on the instrument and click **OK**.
9. Leave the instrument connected and switched on. Start FlashLoader Light (Start > Program files > FlashLoader Light).
10. Select the computer serial port used for communication and press **CTRL** + **SHIFT** + **S**. Deselect the two first Service parameter options and select the *Restore RAM User Data from disk* option selected as shown below:



Please connect ONE instrument to be updated on a communication port.

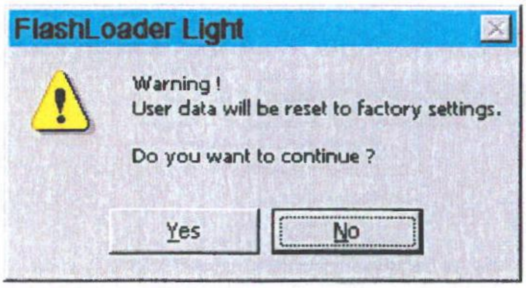
Communication port is :
● COM 2

Services Parameters
☐ Save RAM User Data to disk
☐ Update FLASH Embedded Software
☑ Restore RAM User Data from disk

☐ Keep these parameters next time

11. Click **OK**. FlashLoader Light restores your data. While doing this, the instrument displays “Data transfer in progress“. The FlashLoader Light status bar reads “Restoring user data“.
12. At the end of this transfer and when prompted to do so, switch off then on the instrument and click **OK**. You have retrieved all your data (method data, results, status of the system (electrode connections)).
13. Click **OK**.

User data will be reset to factory settings



Warning !
User data will be reset to factory settings.

Do you want to continue ?

A problem (power failure or disconnection of the PC/ION450 cable) has occurred during execution of "Saving user data to disk" step (see paragraph "Procedure to download a new software version in an instrument").

Check that the instrument is still connected to the PC and switched on.

- If you click **No**, FlashLoader Light reminds you that the updating operation has been cancelled. Nothing has been done: the instrument embedded software has not changed and your data are still in the ION450.
- If you click **Yes**, all data will be reset to default settings (method data, results and the status of the system (electrode connections) are lost).
  Updating procedure goes on (you are prompted for switching off then on the instrument). At the end of "Downloading program file" step, switch off then on the instrument then click **OK**. FlashLoader Light informs you that you have successfully updated the software but have lost all your data.

Philips WINISP software

- As a Shareware Software, you don't need a licence to Install it on your PC.
- This Software is used to update the P89C51 Flash Memory.
- It will be available with an upgraded Flash memory Software from Radiometer Analytical.
- The Philips WINISP Software does not work with Windows NT.

How to use WINISP Software

Install Philips WINISP Software on your PC. **You must use at least the version 2.29.**

1. Insert CD or diskette.
2. In the "Start" Windows menu, enter "D\Setup" (or which ever drive your original Software is on).
3. Follow the installation instructions.
    a. Connect the PC RS232 cable to the "AUX" (or unnamed) socket.
    b. Connect an external keyboard to the ION450 and check its configuration in the setup mode. See the Troubleshooting chapter.
    c. Switch on the ION450.
    d. Press "! 3" on the external keyboard
    e. Choose the ISP mode (and press "enter" on the external key Bd), the ION450's display will revert to the original page.

       Do not change the ION450's parameters until you have reached the end of this procedure.
    f. Run the Philips WINISP Software.
    g. In the Philips WINISP Software "Parameters" Main menu window part:
       Select chip P89C51RB2.
       Select the port on which you previously connected the ION450 cable to the PC.
       Enter 12 for the Oscillator speed (MHz)
    h. In the "Misc" Main menu window part:
       Select "Read". The status display must answer "Boot Vector Read OK".
       The "Misc.Vector" is on "FC"
       The "Misc. Status" is on "0"
    i. In the left Main menu window part, Select "Load File".

       The PC allows you to browse, on your PC, where the file to be loaded is. Open the file suggested by Radiometer Analytical. The Status Display will answer "File loaded OK".

j. In the left part of the Main menu window select “Erase block”.

   In the new “Block Erase Selection” window, in the P89C51RB2 part, select the small blue “0” . Select “Erase”.
   The Window will flash and screen returns to the Main Philips WINISP Software menu.

k. In the left part of the main menu window, select “Program Part”.
   The Status displays “Flash programming successful” at the end of the procedure.

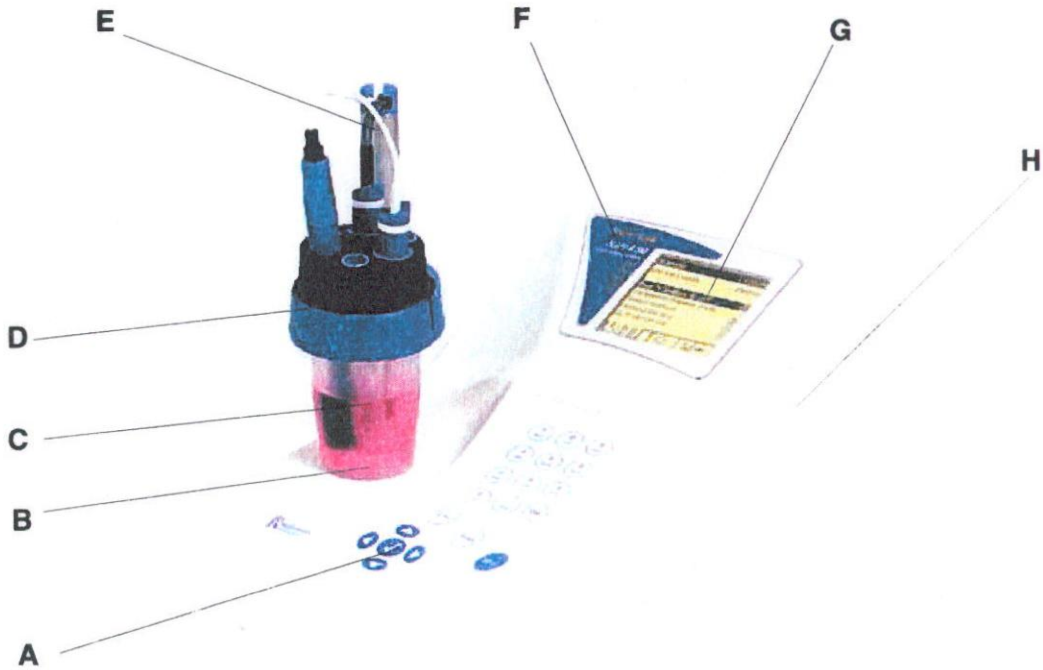
l. Switch off the instrument

m. Quit the Philips WINISP Software.

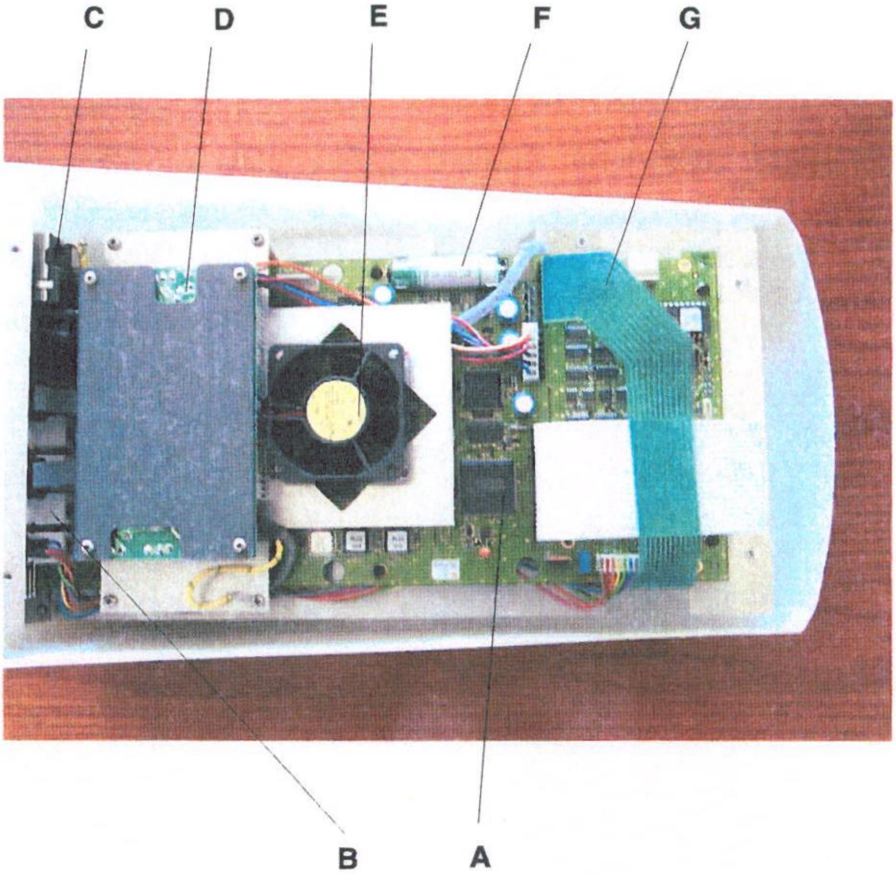
3. Spare Parts

Illustrated service spare part list

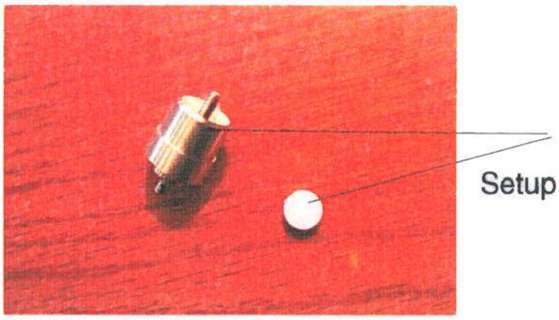
All spare parts specific to the ION450 are included in this list.
Accessories available for the end-user are listed in the Dealer's Catalogue and are therefore not included in this spare part list.



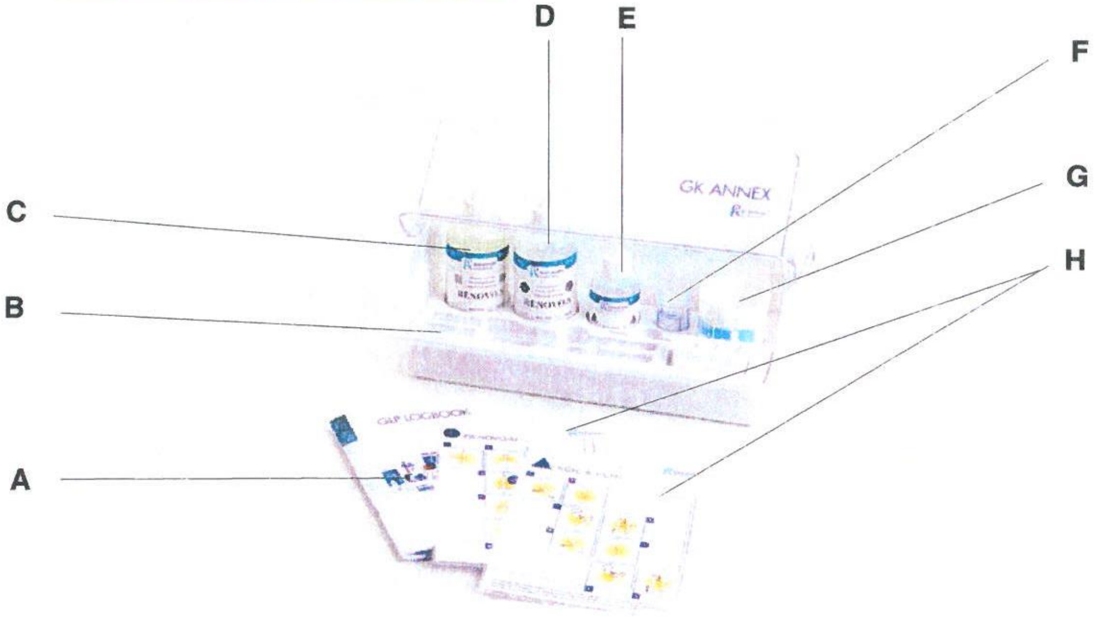
Part	*Description*	*Part no.*
A	Keyboard	M08M503
B	D4012 Stiring magnet, L = 20mm	912-034
C	Titration vessel PP 40-100 ml (pack of 10)	X91T055
	Titration vessel PP 22-45 ml (pack of 10)	X91T056
D	Bayonet electr. head macro, complete with support	X31T106
E	Metal rod D=20mm	X41T016
F	Window	ION450: M08M301
G	Display LED backlit graphic screen	M08M504
H	Casing	ION450: M08M302



Part	Description	Part no.
A	Main Board, P0582	
	(Specify your inst. serial N° when ordering this Bd)	M08M502
B	RS232C Socket including cable and connector	M00Y001
C	Main power switch with fuse and filter	M09T304
D	Switching power supply	M09T501
E	Fan	M02T003
F	Battery	430-127
G	Keyboard	M08M503



X31T123
Setup Parts for ION450 sample stand



Part	*Description*	*Part no.*
A	GLP Logbook English,French, German,Danish, Swedish	D26M005
B	2 Capillary pipettes P507, 2 Graduated pipette P511 Spoon	Not saleable alone
C	RENOVO.X Xtra Strong Cleaning Solution ,250 ml Normal order qty 6	S16M002
D	RENOVO.N Normal Cleaning Solution, 250 ml Normal order qty 6	S16M001
E	KCl.L Saturated solution of KCl , 100 ml Normal order qty 12	S21M002
F	KCl.C KCl Crystals,15 g	S21M001
G	Printed rinse beaker	Not saleable alone
H	RENOVO CARD Operating Instruction card in plastic KCL CARD Operating instruction card in plastic	983-754 983-755

Spare part list

All spare parts specific to the ION450 are included in this list.
Accessories available for the end-user are listed in the Dealer's Catalogue and are therefore not included in this spare parts list.

Electronic

M09T501	Switching power supply without cover.
M08T502	Main PCB P0582, ION450 TIM870.
M08M503	Keyboard ION450.
M08M504	Display, LED backlight graphic screen assembly.

Assembly

M07T801	Stirrer, motor.
M07T802	Stirrer, magnetic rotor assy.

Stand alone parts

450-020	Fuse, slow blow, 1.0A, (5x20 mm)
M02T003	Fan
M00Y001	RS232C socket including cable and connector.
M08M301	Casing assy, ION450
M09T304	Main power supply base (with switch,fuses)
M08M302	Window ION450

Accessories and consumables

Accessories

430-127	Battery Lithium 3.6V
912-034	D4012 Stiring magnet, L = 20mm
X16T005	Notebook Keyboard 83-keys, PS/2 port, US version
X16T006	Notebook Keyboard 83-keys, PS/2 port, French
X16T007	Notebook Keyboard 83-keys, PS/2 port, German
X16T008	Notebook Keyboard 83-keys, PS/2 port, Danish
X16T009	Notebook Keyboard 83-keys, PS/2 port, Spanish
X16T010	Notebook Keyboard 83-keys, PS/2 port, Italian
X16T011	Numeric Keypad, PS/2 port
X41T016	Metal Rod for Titration Manager, D = 20 mm
X41T017	Stop Ring for Titration Manager metal rod
X91T034	Cable Connection Kit

Cable connection

A94P801	Plug Adapter BNC-m / 2 Banana-f
A94P807	Plug Adapter BNC-m/ 1 Banana-f
A95P201	Serial cable D-9F/2m/D-25M (EPSON LX300 or C201P)
A95S001	Line Cord 230V Euro
A95S002	Line Cord 115V
A95X501	Serial Cable, D-9F/2m/D-9F direct PC to ION450
A95X506	Serial Cable, DIN-5M/0.5m/D-9F, Kyoline MTP640 printer

Printer

A70P020	KYOLINE MTP640, 230VAV, Pocket Printer,thermal, 40/80 col. complete with paper, cable & power incl.
A70P021	KYOLINE MTP640, 115VAC, Pocket Printer,thermal, 40/80 col. complete with paper, cable & power incl.
A70P025	Kyoline MTP640 thermal paper (10 rolls)

Consumables

904-487	Titration Vessel, PP, 1-9 ml (pack of 50 pcs)
904-488	Titration Vessel, PP, 8-25 ml (pack of 50 pcs)
904-489	Titration Vessel, PP, 22-45 ml (pack of 50 pcs) (X91T056)
904-490	Titration Vessel, PP, 40-100 ml (pack of 50 pcs) (X91T055)
E16M313	PHC2001-8 Combined pH Electrode, Red Rod; BNC plug
E61M010	CDC566T Conductivity Cell, 4-pole non platin., temp. sensor; removable tube; MAB6
X31T106	Bayonet Electrode Head Macro with support and adapters for Titration Workstation
S91M001	GK ANNEX Maintenance Kit for electrodes,complete (qty 10)
S11M002	pH Standard, IUPAC pH4.005 at 25^{3}C, certified, 500 ml (packs of 6)
S11M004	pH Standard Solution pH7.000 at 25^{3}C, certified, 500 ml (packs of 6)
S11M007	pH Standard, IUPAC pH10.012 at 25^{3}C, certified, 500 ml (packs of 6)
S51M002	KCl 0.1D Conductivity Standard , 500 ml, 0.1 Demal KCl
S51M003	KCl 0.01D Conductivity Standard , 500 ml, 0.01 Demal KCl
X31T123	Setup Parts for ION450 sample stand

Kit structures

S91M001	**GK ANNEX Maintenance Kit for electrodes,complete**
D26M005	GLP.Logbook English,French, German,Danish, Swedish
Not saleable alone	2 Capillary pipettes P507, 2 Graduated pipettes P51 and 1 Spoon
S16M001	RENOVO.N Normal Cleaning Solution, 250 ml Normal order qty 6
S16M002	RENOVO.X Xtra Strong Cleaning Solution ,250 ml Normal order qty 6
S21M002	KCl.L Saturated solution of KCl , 100 ml Normal order qty 12
S21M001	KCl.C KCl Crystals,15 g
Not saleable alone	Printed rince beaker
983-754	RENOVO CARD Operating Instruction card in plastic
983-755	KCL CARD Operating instruction card in plastic

D91M002		**ION450,OI-Tr Documentation Kit, trilingual**
D26M009	1	Reference Manual for Ion Analysers, CD-ROM
D21M075	1	User's Guide for ION450, trilingual
D21M076	1	Short-Form Reminders for ION450, English

X91T034	**Cable connection kit**
450-020	2 fuses, slow blow, 1.0A, (5X20mm)
A95P201	Serial cable, D-9F/2m/D-25M
A95S001	Line cord 230V Euro
A95S002	Line cord 115V
A95X501	Serial cable, D-9F/2m/D-9F direct

X91T035	**Cell kit**
X41T016	Metal rod for Titration Manager, D=20mm
X41T017	Stop ring for Titration Manager metal rod
X31T106	Bayonet electrode head macro, complete with support
912-034	D4012, Stirring magnet, L=20mm

Documentation

D26M010	Installation Guide for ION450, trilingual
D21M075	User's Guide for ION450, trilingual
D21M076	Short-Form Reminders for ION450, English
D21M077	Short-Form Reminders for ION450, French
D21M078	Short-Form Reminders for ION450, German
D21M079	Reference Manual ION450, English
D21M080	Reference Manual ION450, French
D26M009	Reference Manual for Ion Analysers, CD-ROM
D91M002	ION450,OI-Tr Documentation Kit, trilingual

ION450 Sales versions

R21M116	ION450-Co Analyser, complete with electrodes, buffers & accessories
R21M118	ION450-Ba Analyser, with accessories

Software for ION450

R31T011	FlashLoader Light, Embedded Software upgrade utility for instruments
R31M015	IONxx Embedded Software Upgrade (Via FlashLoader)

4. Control Procedure

Introduction

The following control procedure should be carried out to check the main parts of the ION450.

If one or more tests fail, contact the Radiometer Analytical Service Specialist to establish a diagnostic. If the ION450 passes all the tests, this demonstrates with a sufficiently high confidence level that the instrument functions as expected.

Test equipment

- Personal computer with at least Windows 95 and an available serial port.
- Serial cable, part number A95X501. A cable schematic is shown in section 7.
- Digital voltmeter (DVM)
- Oscilloscope.
- Male BNC to female banana adapter, part no. A94P801
- Male banana to male banana cables.
- Male BNC to male BNC cable.
- Test soft with the scripts: "A084W01A ION450 English Service.idc"
  or "A084W01A ION450 French SAV.idc"
- External adjustable power supply
- Decade box (1Mohm to 10 ohm)
- Special battery test tool. (See next page to build your tool).
- Special RS232 female 9-pin connector input/output simulator (See next page to build your tool).
- A Conductivity Test cable (See next page to build your tool).

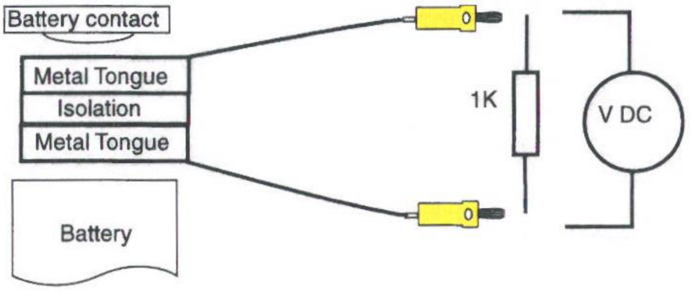
Build your own battery test tool

To check the current used by the instrument in standby mode, insert an amperemeter in the battery's circuit. As the current to be measured is very low, the instruments response may be weak. Adding a 1 Kohm resistor in the circuit, measures the voltage across this resistor and accurately calculates the current.

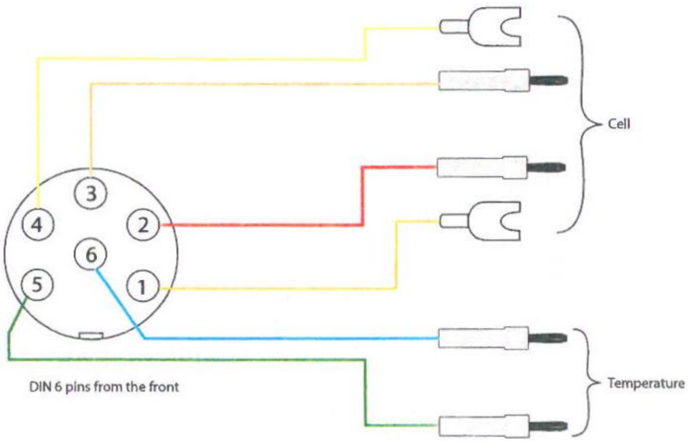
Refer to the figure below in order to build the test tool.

Example: when 20 mV is measured across a 1 K-ohm resistor, the current calculated = 20 µA.

Note: Check and/or tight the battery contacts after this test..


Battery contact
Metal Tongue
Isolation
Metal Tongue
Battery
1K
V DC

Build your Conductivity cell test cable


3
4
2
6
5
1
Cell
Temperature
DIN 6 pins from the front

The cable must not be longer than 40 cm. Do not use any coaxial with ground.

On the socket, the pin 1 is an active electrode.
On the socket, the pin 2 is an measuring electrode.
On the socket, the pin 3 is an measuring electrode.
On the socket, the pin 4 is an active electrode.

The dummy cell (very precise decade box which must be linked to a metrology system) will be connected between 1+2 and 3+4.

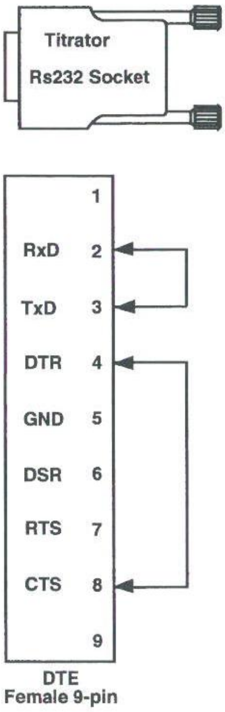
It is important to connect the bananas male connector (2 and 3) to the both socket tops and the 2 open eyelets (1 and 4) screwed and secured on the socket bottoms.

The resistor introduced by a banana plug connections isn't negligible in the lowest conductivity. It is why it is necessary to connect the pin 2 and 4 by an open eyelet. To the decade box.

For the test, the 1 and 2 are connected on the same socket and the 3 and 4 are connected on the other one.

Build your own RS232 simulator connector

To check the RS232 input/output with TestSoft and the script for ION450, build your own simulator connector as shown below.



Preliminary steps

The instrument must have been running at ambient temperature for at least half an hour before the following tests are carried out.

Autotest

After power-on, during the autotest sequence:

Heard 1 bip and 2 bips

On the display appears for a few seconds the embedded software version and the main menu.

Display test

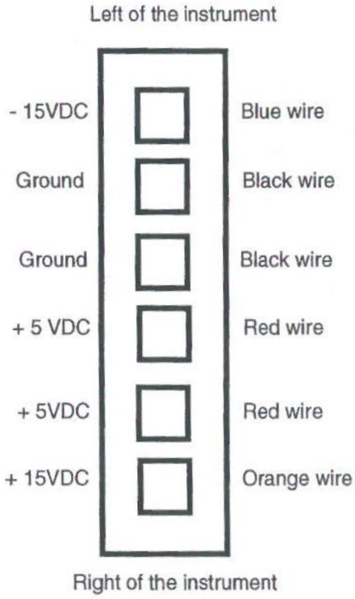
Immediately after the autotest, press **9** several times. The display contrast will continuously move from light to dark. Pressing **Del**, the display will continuously from dark to light.

Switching power supply

The switching power supply is the module installed under the main board.

When the instrument is open, upside down, check the +5VDC +/-0.25V, +15VDC +/-0.9V and -15VDC +/-0.8V.

Instrument upside down,
on the main board,
switching power supply connector.


Left of the instrument
- 15VDC
Blue wire
Ground
Black wire
Ground
Black wire
+ 5 VDC
Red wire
+ 5VDC
Red wire
+ 15VDC
Orange wire
Right of the instrument

Main board power supply

- Switch off the instrument and disconnect the mains power cord.
- Turn the instrument upside down.
- Open the instrument
- Remove the 4 screws holding the board supporting the switching power supply and the fan.
- Disconnect the fan.
- Move this subassembly to the right of the instrument.
- Connect the main power cord and switch on the instrument.
- To check the different power supplies, refer to the PO58 Component layout in the drawing section.
- Connect the Digital voltmeter "-" probe to the ground socket on the rear panel. Switch on the instrument and wait for the 2 bips.

  Check the +12 VDC +/-0.5V: on the U90 regulator (See next page).

  Check the +5 Va (DC) +/-0.2V : on the C252 capacitor (See next page).

  Check the -5 Va (DC) +/-0.2V: on the T38 transistor (See next page).

  Check the -6 Va (DC) +0.2V/-0.3V: on the T39 and transistor (See next page).

  Check the -6 Vc (DC) +0.2V/-0.3V: on the U91 and regulator (See next page).

Other tests on the main board

See on the next page for several test points:

4 x clocks and other counters

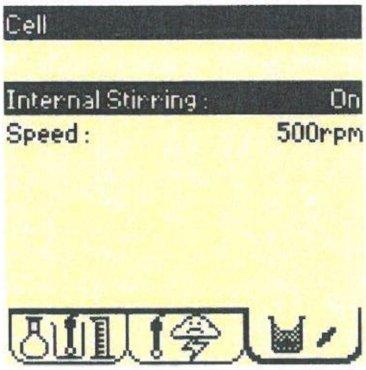
Stirrer internal and external signals.

Relay 1 and 2 commands.

Electrodes inputs after the first amplifier.

Stirrer test

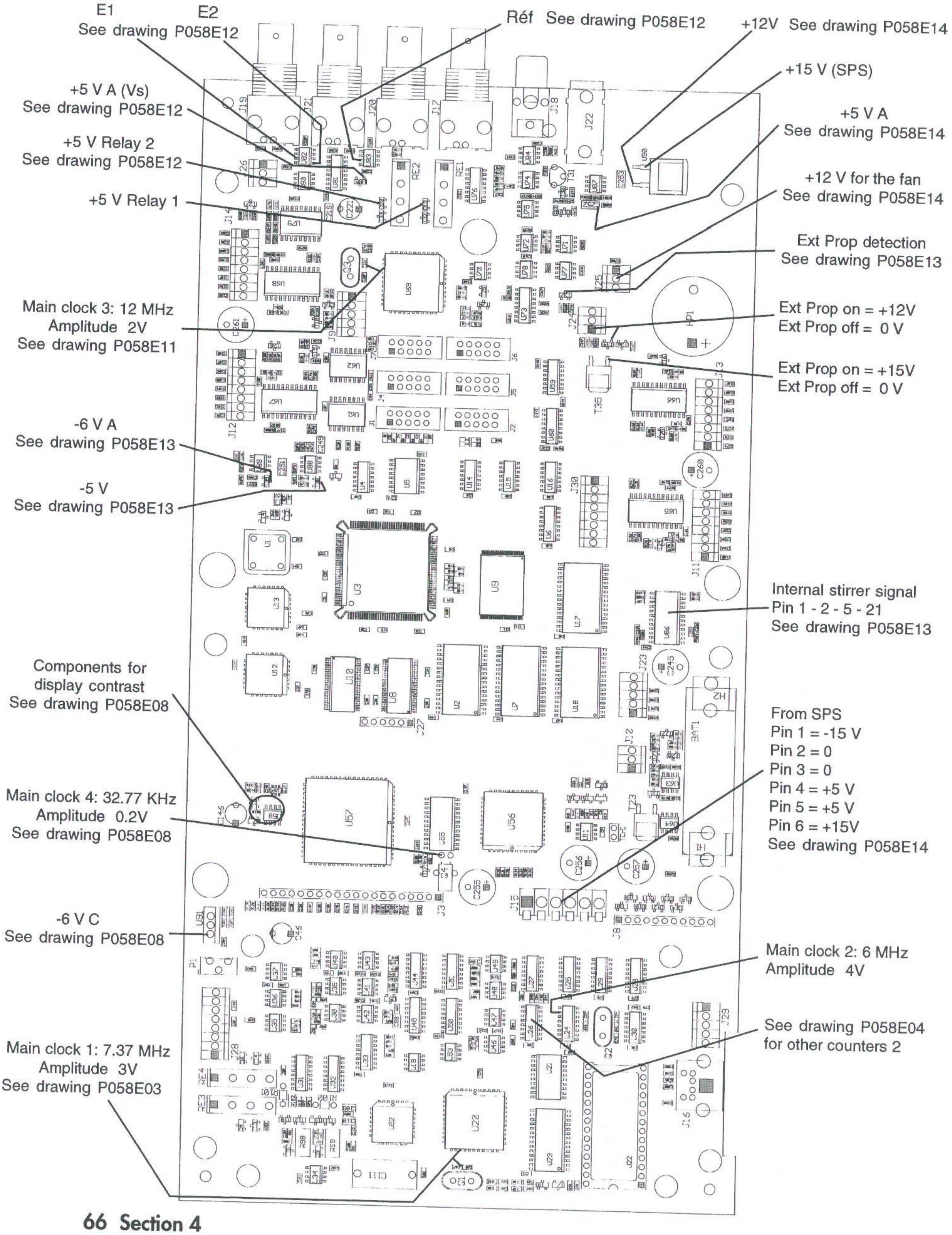
Setup your instrument.



Internal Stirring : On

Speed : 500rpm

Check the stirrer command signal on the connector J23 pin1.



E1
E2
See drawing P058E12

+5 V A (Vs)
See drawing P058E12

+5 V Relay 2
See drawing P058E12

+5 V Relay 1

Main clock 3: 12 MHz
Amplitude 2V
See drawing P058E11

-6 V A
See drawing P058E13

-5 V
See drawing P058E13

Components for
display contrast
See drawing P058E08

Main clock 4: 32.77 KHz
Amplitude 0.2V
See drawing P058E08

-6 V C
See drawing P058E08

Main clock 1: 7.37 MHz
Amplitude 3V
See drawing P058E03

Réf See drawing P058E12

+12V See drawing P058E14

+15 V (SPS)

+5 V A
See drawing P058E14

+12 V for the fan
See drawing P058E14

Ext Prop detection
See drawing P058E13

Ext Prop on = +12V
Ext Prop off = 0 V

Ext Prop on = +15V
Ext Prop off = 0 V

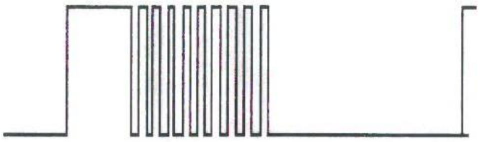
Internal stirrer signal
Pin 1 - 2 - 5 - 21
See drawing P058E13

From SPS
Pin 1 = -15 V
Pin 2 = 0
Pin 3 = 0
Pin 4 = +5 V
Pin 5 = +5 V
Pin 6 = +15V
See drawing P058E14

Main clock 2: 6 MHz
Amplitude 4V

See drawing P058E04
for other counters 2

The signal envelop is as shown below and the frequency period as in the next table.



The time period is as in the next table and the positive square envelop signal is just half period.

100	rotations per minute	100 ms
200	"	50 ms
400	"	25 ms
500	"	20 ms
800	"	12.5 ms
1100	"	9 ms

Main board analog module calibration procedure

Required equipment

3 x male BNC to female banana adapter part N° A94P801.

2 x long male banana to male banana cables

2 x short male banana to male banana cables

An external power supply, calibrated and linked to an ISO system with its certificate. Do not try to calibrate any instrument without this typical external power supply.

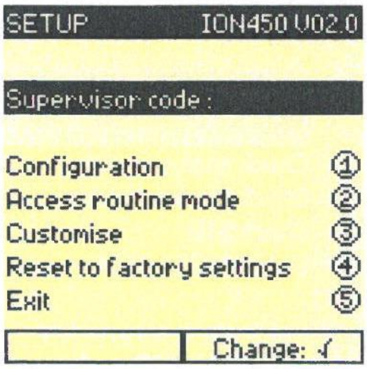
A 10 Kohm 0.1% resistor mounted on a cinch connector.

Preliminary steps

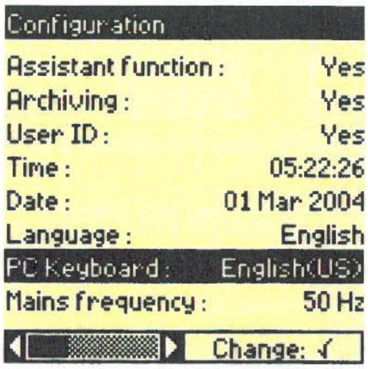
Connect an external keyboard

Switch on the instrument.

Press **Stop** for 5 seconds in the Main window to enter the Setup menu.


SETUP ION450 V02.0
Supervisor code :
Configuration ①
Access routine mode ②
Customise ③
Reset to factory settings ④
Exit ⑤
Change: √

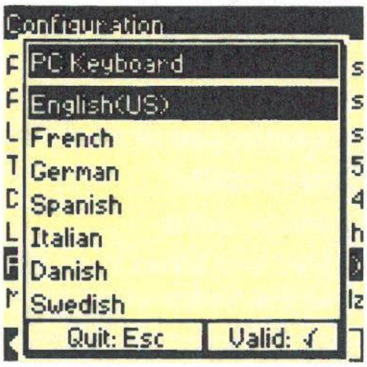
Press **1** to enter the Configuration menu.



Configuration

Assistant function : Yes
Archiving : Yes
User ID : Yes
Time : 05:22:26
Date : 01 Mar 2004
Language : English
PC Keyboard : English(US)
Mains frequency : 50 Hz

Change the “ PC Keyboard ” to accord it with the physically connected external keyboard.

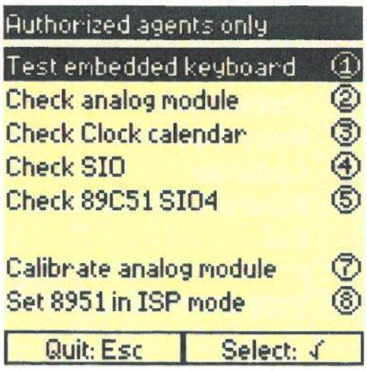


Configuration
PC Keyboard
English(US)
French
German
Spanish
Italian
Danish
Swedish
Quit: Esc
Valid: √

When external Keyboard selected, press **Esc** to exit from the configuration mode and come back to the ION450 main menu.

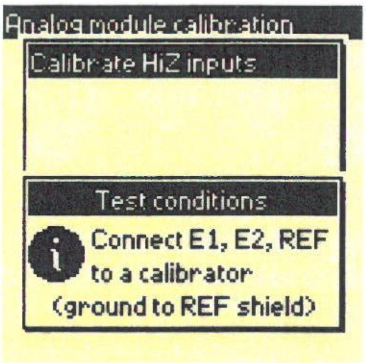
Start the Main Bd analog module calibration

On your external keyboard type **!c** or **!C**
On your ION450, you must display this window.



Authorized agents only
Test embedded keyboard ①
Check analog module ②
Check Clock calendar ③
Check SIO ④
Check 89C51 SIO4 ⑤
Calibrate analog module ⑦
Set 8951 in ISP mode ⑧
Quit: Esc
Select: √

Press **7** to enter in the “Calibrate Analog module” procedure.



Analog module calibration

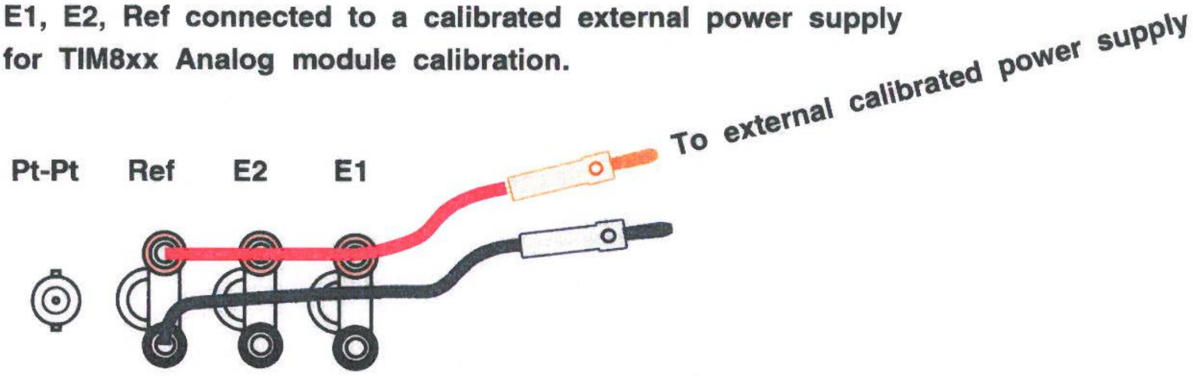
Calibrate HiZ inputs

Test conditions

Connect E1, E2, REF
to a calibrator
(ground to REF shield)

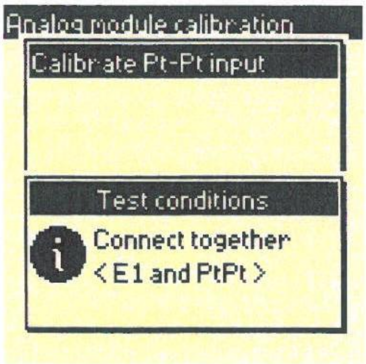
Follow the instruction displayed by the ION450 and connect the external power supply as shown on the next diagram.

E1, E2, Ref connected to a calibrated external power supply for TIM8xx Analog module calibration.



When connected, press the check mark on the ION450 keyboard.
Follow the instructions given by the ION450 display.

When the ION450 displays the next instruction....



Analog module calibration

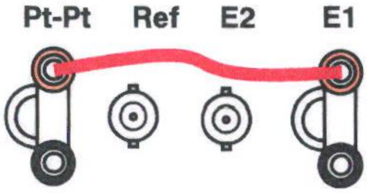
Calibrate Pt-Pt input

Test conditions

Connect together
< E1 and PtPt >

....connect E1 to Pt-Pt.

E1 connected to Pt-Pt for Analog module calibration.



Follow again the ION450 displayed instructions.
When the calibration is completed, exit form the calibrated analog module menu.

Analog test with TestSoft

Connect the ION450 to a PC serial port.

Install TestSoft on the PC and copy the script on the TestSoft directory.

TestSoft introduction

TestSoft software allows you to send instructions directly to pilot a Radiometer Analytical instrument. Using a Procom communication protocol, TestSoft will automatically guide you step-by-step to adjust the instrument.

For the ION450, one available script is written to allow you to check the entire instruments electronic parts. A few adjustments must be made.

Software setup

1. Insert the Service CD-ROM.
2. In “Start” Windows menu; Run “d: \ D:\Softwares for Service\TestSoft\Install English Software v2.03\ Setup.exe”.
3. Follow the installation as described in the software.
4. With “Windows Explorer”, copy script corresponding to your instrument in the TestSoft directory. (D:\Softwares for Service\TestSoft\Script)
5. Connect the PC serial port to ION450 "PC/Printer” input (on rear panel).
6. Switch on the instrument.

Using the software

1. Start the TestSoft program with: “Start, Programme, TestSoft”.
2. In the new window with menus File, Com, Go to, select “File”.
3. Open the script with “Open control instruction”.
4. See the new window and select the script according to the instrument you want to test. On the main page, in the “Instruction” windows, you see the selected file name.
5. Select “File, New instrument” and fill in the information required to create your test or adjustment the result file. The result file's default name is the instrument number with the extension “.rdc”. It is a text file which can be viewed or printed with any text editor. If necessary choose the directory where you want to save your file. For example: C:\ Program file \TestSoft.
6. Continue.
7. Click “Start” to run the test. Follow the instructions given in the “Action” window.

Notes:

Options available for the program:

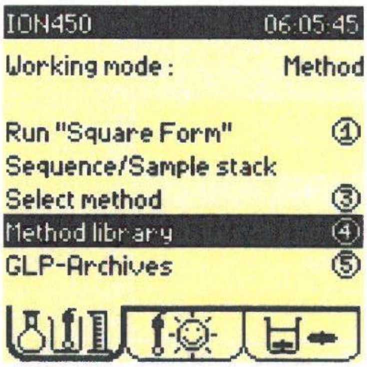
Move back and forth in the test or adjustment script using “Previous” and “Next” buttons or the “Go to” command in the “Go to” menu.

You can interrupt the control at any time. The program allows you to restart the control at the point at which you left off. When you restart “TestSoft”, answer “No” when the software prompts you for a new instrument.

The Pt-Pt electrode input test

The Pt-Pt electrode input signal is present in the KF mode only.

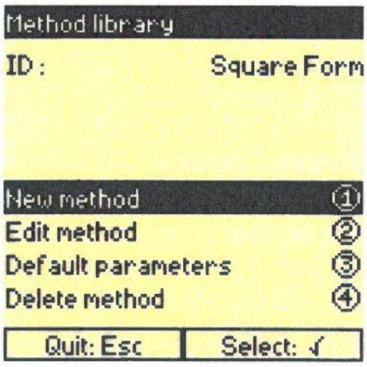
- Connect a decade box with an adapter (BNC male to 2 female banana, part number A94P801).
- Adjust the decade box to 10 Kohm
- Connect an oscilloscope across the decade box.
- To set-up the ION450, select:


ION450 06:05:45

Working mode : Method

Run "Square Form" ①
Sequence/Sample stack
Select method ③
Method library ④
GLP-Archives ⑤

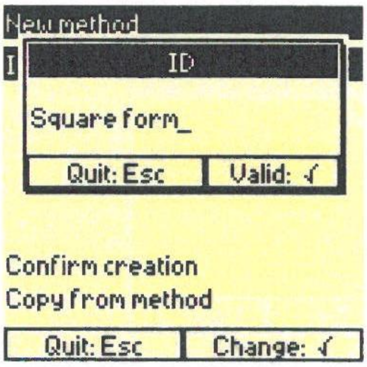
and


Method library

ID : Square Form

New method ①
Edit method ②
Default parameters ③
Delete method ④
Quit: Esc
Select: √

Enter the name for a special test method (In this example it is "Square form"):


New method

ID

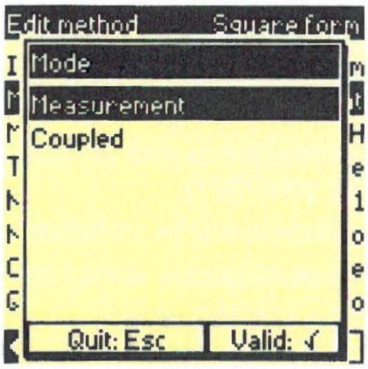
Square form_

Quit: Esc
Valid: √
Confirm creation
Copy from method
Quit: Esc
Change: √

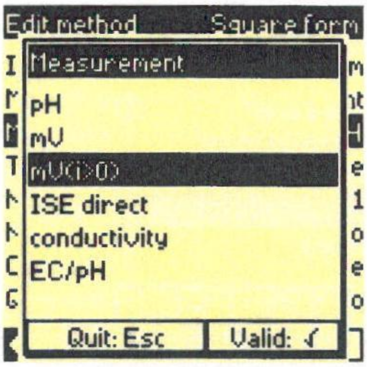
Validate and confirm this creation.

The instrument will ask you to enter all the method parameters. Enter the necessary information to build a simple "Measurement" method to obtain the square signal on the Pt-Pt electrode input.

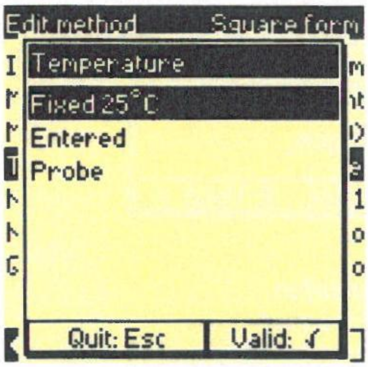
In the "Mode" menu, press ✓ and select **Measurement.** Validate by✓.


Edit method
Square form
Mode
Measurement
Coupled
Quit: Esc
Valid: ✓

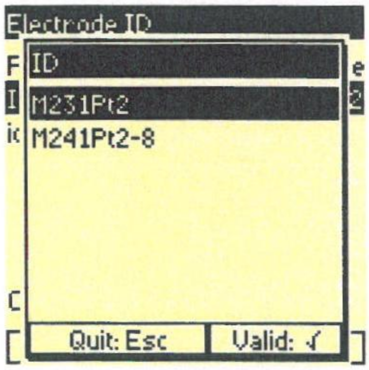
In the "Measurement" menu, press ✓ and select **mV(i>0).** Validate by ✓. This applies the current on the electrode.


Edit method
Square form
Measurement
pH
mV
mV(i>0)
ISE direct
conductivity
EC/pH
Quit: Esc
Valid: ✓

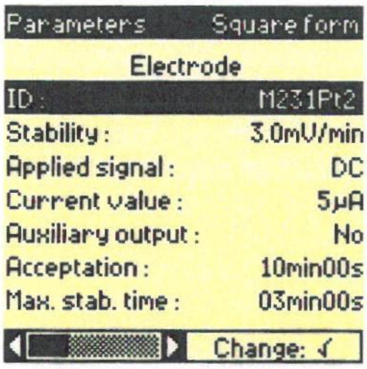
As you do not need a temperature probe to run this test, in the "Temperature" menu, press ✓ and select **Fixed 25°C.** Validate by ✓.


Edit method
Square form
Temperature
Fixed 25°C
Entered
Probe
Quit: Esc
Valid: ✓

Go to the 8th line to enter the **Method parameters**, press ✓ and select an electrode from the catalogue or from the user category. Press ✓.

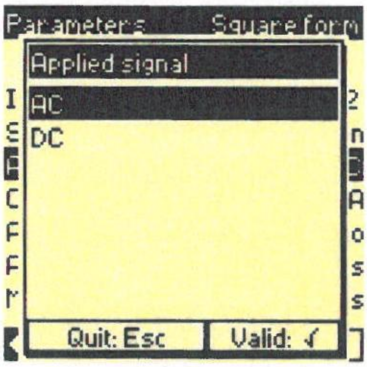

Electrode ID
ID
M231Pt2
M241Pt2-8
Quit: Esc
Valid: ✓

When an electrode has been selected, you should obtain a window like this one:


Parameters
Square form
Electrode
Change: ✓

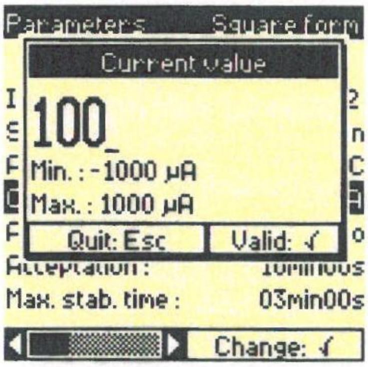
ID : M231Pt2
Stability : 3.0mV/min
Applied signal : DC
Current value : 5µA
Auxiliary output : No
Acceptation : 10min00s
Max. stab. time : 03min00s

To get a square current form, in the "Applied signal" menu, select **AC.** Validate by ✓.


Parameters
Square form
Applied signal
AC
DC
Quit: Esc
Valid: ✓

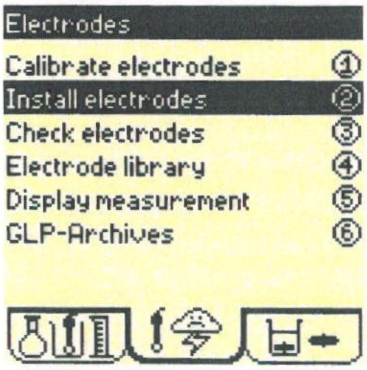
In the "Current value" menu, enter **100.** Validate by ✓.

Press **Esc** 3 times to return to the ION450 main menu.


Parameters
Square form
Current value
Quit: Esc
Valid: ✓
Change: ✓

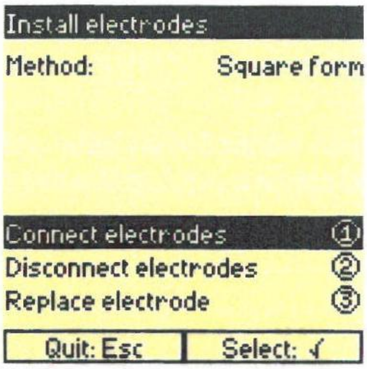
100_
Min. : -1000 µA
Max. : 1000 µA
Max. stab. time : 03min00s

In the Electrodes menu, it is necessary to connect the electrode already chosen in the previously created method. Select **Install electrode** and press ✓.


Electrodes
Calibrate electrodes ①
Install electrodes ②
Check electrodes ③
Electrode library ④
Display measurement ⑤
GLP-Archives ⑥

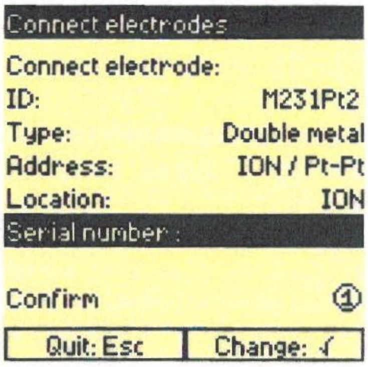
On the "Method" line, see the previously created method name.

Confirm "Connect an electrode" by pressing Validate by ✓.


Install electrodes
Connect electrodes ①
Disconnect electrodes ②
Replace electrode ③
Quit: Esc
Select: ✓

Method: Square form

You should see the electrode name given in the method. Press **1** to confirm.

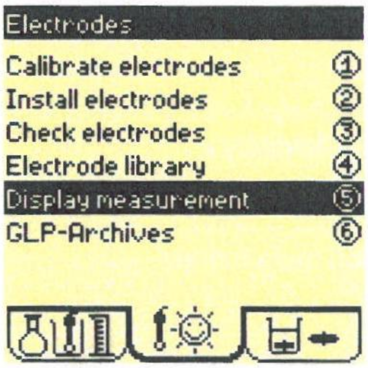

Connect electrodes
Confirm ①
Quit: Esc
Change: ✓

Connect electrode:
ID: M231Pt2
Type: Double metal
Address: ION / Pt-Pt
Location: ION
Serial number :

You should obtain the main menu with a sunny icon.

Select **Display measurement.**

You should observe a square form signal across the decade box.


Electrodes
Calibrate electrodes ①
Install electrodes ②
Check electrodes ③
Electrode library ④
Display measurement ⑤
GLP-Archives ⑥

Interpreting results:

- With the decade box set to 10 Kohm, the square is normally around 2 V.
- On the ION450 display, you should read 1000.0 mV.
- The displayed current on the ION450 is the previously programmed one. In the example, it was 100µA AC.
- With the decade box set to 20 Kohm, the square will normally be around 4 V
- The displayed mV value should change to 2000.0 mV.

Conductivity module check-up

It is possible to check this module without running the entire TestSoft procedure or running the entire analogue input procedure.

It is necessary to use a theoretical perfect dummy electrode with a cable as best as possible.

1. A description of the cable and a drawing is described at the beginning of this section 4.
2. An electrode creation must been done in the instrument.

ION450 set-up.

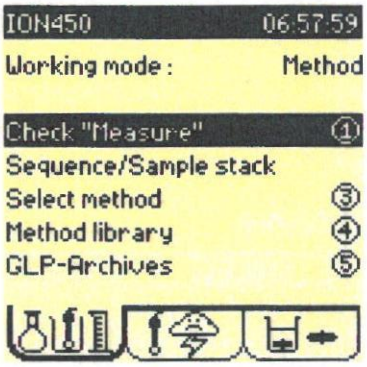
Establish the factory settings.

Press the **Stop** key more than 3 second to enter the set-up menu,

Press **4** to choose the factory settings and confirm by **1**.

Adjust the screen contrast with the keys **0** or **7**.

Quit the set-up menu pressing **key 5**. You must get the following screen:



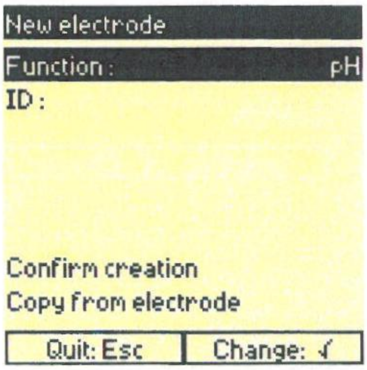
ION450 06:57:59

Working mode : Method

Check "Measure" ①
Sequence/Sample stack
Select method ③
Method library ④
GLP-Archives ⑤

Electrode set-up

In the Electrode menu, press **4** Electrode library, and start creating a new electrode, by pressing **1** New electrode :



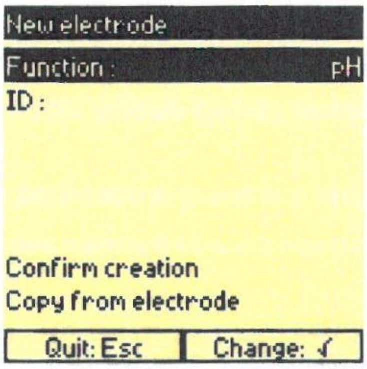
New electrode

Function : pH

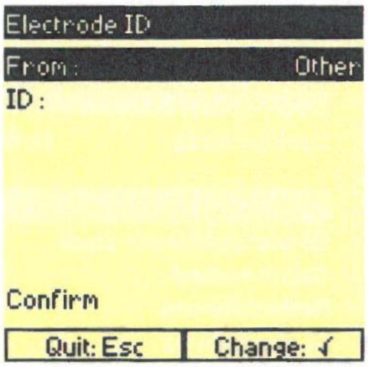
ID :

Confirm creation
Copy from electrode
Quit: Esc
Change: √

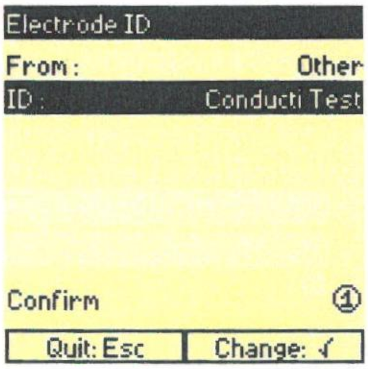
Select the correct function to be applied to the electrode (Conductivity) and validate.
Note: This function is on the screen 8th line.


New electrode
Function : pH
ID :
Confirm creation
Copy from electrode
Quit: Esc
Change: √

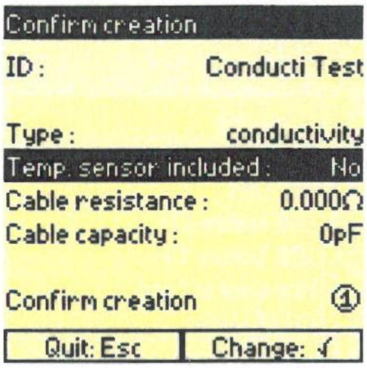
Select the **ID** line to enter a new electrode label and validate.
At the **From: Catalogue** line, select **Other** and validate.


Electrode ID
From : Other
ID :
Confirm
Quit: Esc
Change: √

Select the new **ID** line to enter the new electrode name (for example: **Conducti Test**).


Electrode ID
From : Other
ID : Conducti Test
Confirm ①
Quit: Esc
Change: √

Press **1** to validate the name.
Press **1** twice to confirm the electrode creation.



Confirm creation

ID : Conducti Test

Type : conductivity

Temp. sensor included : No

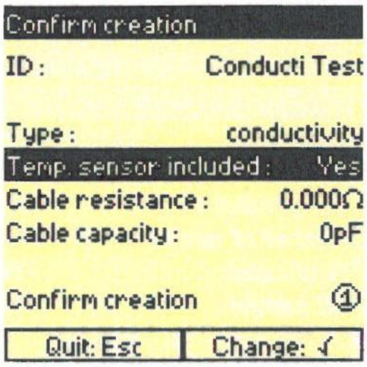
Cable resistance : 0.000Ω

Cable capacity : 0pF

Confirm creation ①

Quit: Esc | Change: √

Select **Temp. sensor included = Yes** and confirm by **1**.



Confirm creation

ID : Conducti Test

Type : conductivity

Temp. sensor included : Yes

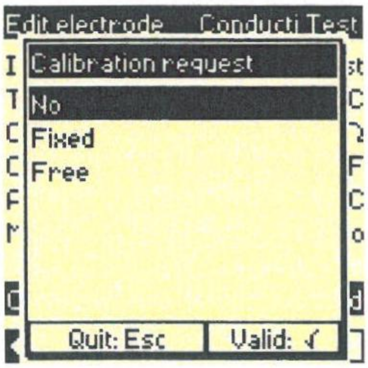
Cable resistance : 0.000Ω

Cable capacity : 0pF

Confirm creation ①

Quit: Esc | Change: √

Select **Calibration request = No** and validate. Press **Esc** twice to display the Electrode main menu.



Edit electrode Conducti Test

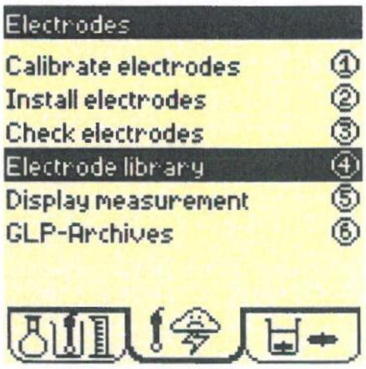
Calibration request

No

Fixed

Free

Quit: Esc | Valid: √



Electrodes

Calibrate electrodes ①

Install electrodes ②

Check electrodes ③

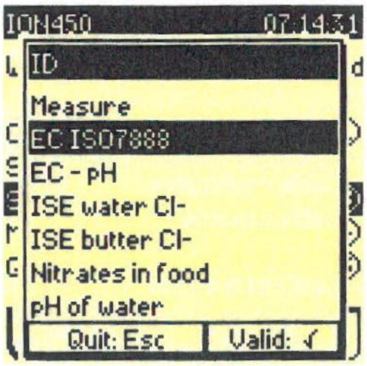
Electrode library ④

Display measurement ⑤

GLP-Archives ⑥

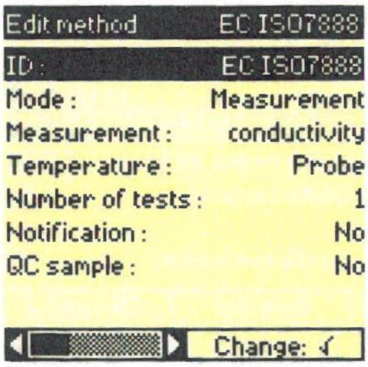
Method set-up.

In the Method/sequence screen, press **3** Select method. Select the "EC ISO7888" method.


ION450 07:14:31
ID
Measure
EC ISO7888
EC - pH
ISE water Cl-
ISE butter Cl-
Nitrates in food
pH of water
Quit: Esc
Valid: √

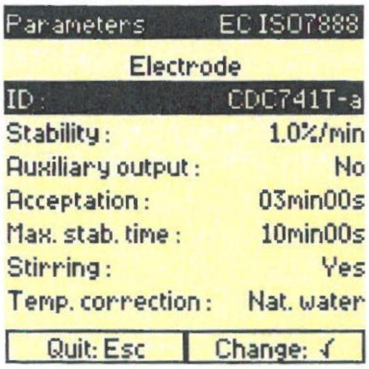
Define now the previously created electrode in your EC ISO7888 method:

- Select **4** then **2**,


Edit method EC ISO7888

ID : EC ISO7888
Mode : Measurement
Measurement : conductivity
Temperature : Probe
Number of tests : 1
Notification : No
QC sample : No

- Go to the last Edit method screen using the **Right arrow** key.
- Press **1 Method parameters,**

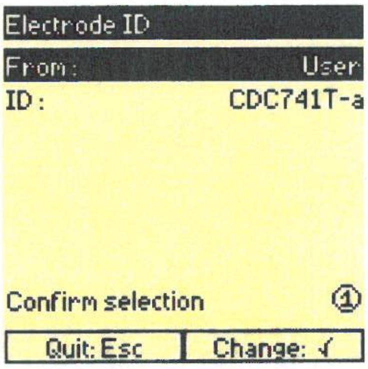

Parameters EC ISO7888

Electrode

ID : CDC741T-a
Stability : 1.0%/min
Auxiliary output : No
Acceptation : 03min00s
Max. stab. time : 10min00s
Stirring : Yes
Temp. correction : Nat. water

Quit: Esc
Change: √

- Press ✓ and select the **ID** line and press ✓.



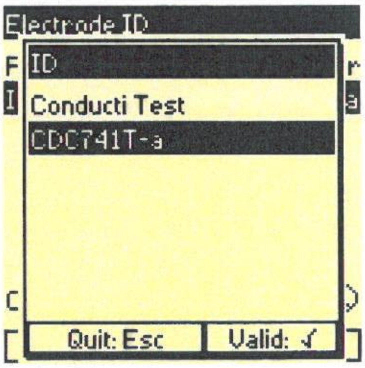
Electrode ID

From : User

ID : CDC741T-a

Confirm selection ①

Quit: Esc
Change: √



Electrode ID

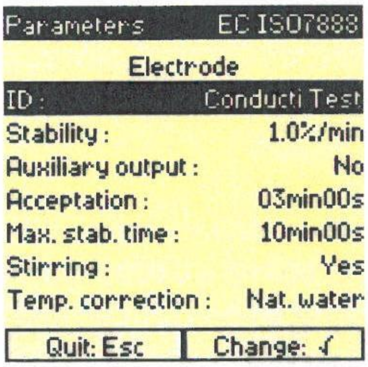
ID

Conducti Test

CDC741T-a

Quit: Esc
Valid: √

- At the line **ID** select **Conducti Test** and confirm by **1**.



Parameters EC ISO7888

Electrode

ID : Conducti Test

Stability : 1.0%/min

Auxiliary output : No

Acceptation : 03min00s

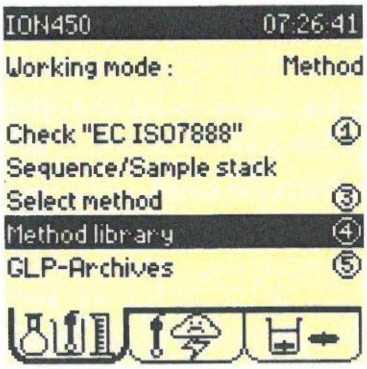
Max. stab. time : 10min00s

Stirring : Yes

Temp. correction : Nat. water

Quit: Esc
Change: √

- Press **Esc** three times to come back to the main menu.



ION450 07:26:41

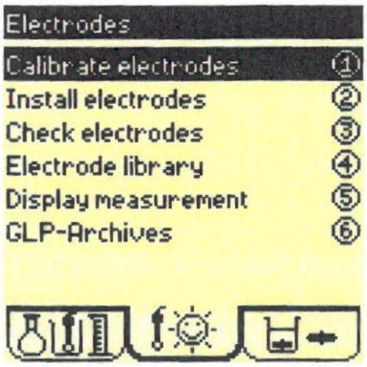
Working mode : Method

Check "EC ISO7888" ①
Sequence/Sample stack
Select method ③
Method library ④
GLP-Archives ⑤

Electrode installation

In the Electrode menu, press **2** then **1** and connect the **Conducti Test** electrode.

A sun must be displayed in the Electrode tab on the bottom of the screen. You are ready to start a measurement pressing **5 Display measurement**.


Electrodes
Calibrate electrodes ①
Install electrodes ②
Check electrodes ③
Electrode library ④
Display measurement ⑤
GLP-Archives ⑥

Connect the decade boxes to the ION450 using the conductivity cable. See the "Build your conductivity cell test cable" section.

Adjust the decade box to 400 ohm.

Check that the reading is: 2.500mS ± 0.008 mS/cm.

Adjust potentiometer P1 to obtain 2.500mS ± 0.008 mS/cm on the display.

Insert a 4 Kohm resistor decade box between pin 1 and pin 2 of the **Cell** socket.

Check that the reading has not changed (2.500mS ± 0.008 mS/cm).

If necessary, adjust potentiometer P1 to obtain 2.500mS ± 0.008 mS/cm on the display.

Temperature control

As the 10 Kohm resistor has already been connected on the cable **Temp** socket, check that the temperature displayed on the ION450 screen is 25°C ± 0.1°C.

Disconnect the 10 Kohm resistor from the cable Temp socket, the line "Tem.: 25°C Probe" must disappear.

Measurement linearity

Check that the reading is according to the table below:

Resistor value	Display	Tolerance
4 ohm	250.0 mS / cm	± 0.800 mS / cm
40 ohm	25.00 mS / cm	± 0.080 mS / cm
250 ohm	4.000 mS / cm	± 0.011 mS / cm
300 ohm	3.333 mS / cm	± 0.010 mS / cm
400 ohm	2.500 mS / cm	± 0.008 mS / cm
1 KOhm	1.000 mS / cm	± 0.005 mS / cm
4 KOhm	0.250 mS / cm	± 3 µS / cm
10 Kohm	0.100 mS / cm	± 3 µS / cm
40 Kohm	0.025 mS / cm	± 3 µS / cm
100 Kohm	0.010 mS / cm	± 3 µS / cm
1 Mohm	0.001 mS / cm	± 3 µS / cm

Prepare the instrument for the customer

The instrument must be configured for the end user analyses.
Press the **Stop** key for more than 3 second to enter the set-up menu,
Press **4 Reset to factory settings** and confirm by **1**
Adjust the screen contrast with the keys **0** or **7**.
Press **5** to quit the set-up menu.

5. Troubleshooting

A number of tests are automatically performed when the ION450 is switched on and during measurement. A number of tests are available under the external PC keyboard code !C or !c. The following procedure will help you detect a defective assembly or sub-assembly. In section 4 "Control procedure" TestSoft will automatically perform tests on most instrument parts and will demonstrate with a sufficiently high confidence level that the instrument complies with specifications and performance levels. However, if one or more tests does not correspond to the correct value, you will probably have to change at least one of the different modules in the instrument. In most cases, refer to the diagram page 1 in the electronic section.

If you have forgotten an operation while editing the method, icons visible in the Electrode windows indicate that an error(s) has occurred.

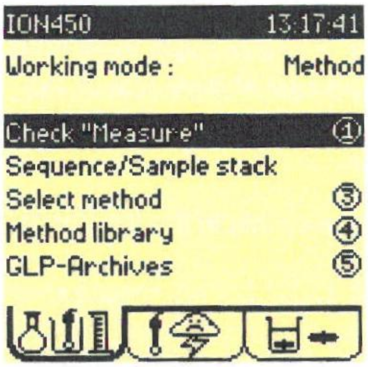
To find out where the error has occurred and to help you solve them, run the "Check" command in the Main window, refer to the next page.

The "Check" command

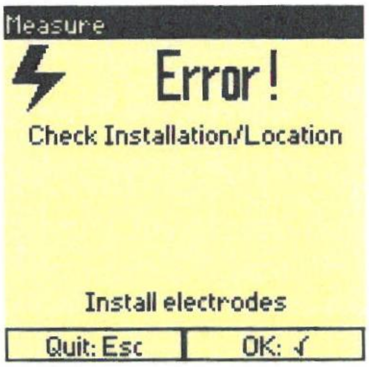
When Cloudy/Stormy/Question mark icons appear in the Electrode window, press 1 to run the "Check" command.

The ION450 will automatically guide you through the operations required to solve the problems encountered.

For example:


ION450 13:17:41
Working mode : Method
Check "Measure" ①
Sequence/Sample stack
Select method ③
Method library ④
GLP-Archives ⑤

Press **1**

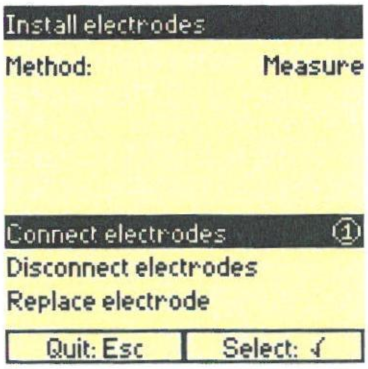

Measure
Quit: Esc
OK: ✓

Error!

Check Installation/Location

Install electrodes

Press ✓


Install electrodes
Method: Measure
Connect electrodes ①
Disconnect electrodes
Replace electrode
Quit: Esc
Select: ✓

Press **1** to start the Electrode Installation procedure.

No switching power supply output voltages:

Check input power supply and check the fuse on the switching power supply board. Without minimum output current, some switching voltages may not be present.

Exchanging the main board:

You have to calibrate the analog module. See the "Control procedure" section. You have to enter the instrument serial number in the memory or specify with your order the instrument serial number on which the new board will be fitted.

No adjustable display contrast:

Check transistor T15, D7 and ship U58 on the main board P058.

White screen:

During servicing and after a screen assembly wrong connection: See "No adjustable display contrast".

After a FlashLoader operation: Contact your Radiometer representative.

Controller P89C51 suspect:

Connect an external Keyboard. The Num LED must be on.

Wrong pH reading values:

Connect a BNC - 2 female banana adapter (A94P801). Make a short-circuit on the 2 female banana plugs. Read the mV value in the "Display measurement". The value should be close to 0 mV. Link the electrode negative pole to the rear panel female banana ground socket.

Check the setup. Disconnect all the electrodes in the electrode menu. Go the install electrode and connect the only one electrode necessary for the application. A sun must be present on the electrode window index.

Check the contacts.

Check the electrode.

Change the main board.

Vibration stirrer motor and it doesn't turn:

Bad contact between the connector and the socket.

Wrong connection between the wire and the connector itself

Bad soldered pin on the ship U86.

U86 ship defective.

The motor is defective.

Instrument reset alone or bip alone:

Check the switching power supply cables.

Check all supplies with spik and micro power off detection.

The Pt-Pt electrode square signal isn't present (ION450 KF control procedure mode):

Check the power supplies.

Check the wires on the BNC socket.

Check the power on reset routine (Autotest).

Check the method. Is it a KF one?.

Check the installed electrode in the method. Is it an electrode for KF?.

Check the circuit with the schematic P058E12 in the drawings section.

Change the mainboard.

Noisy or wrong results:

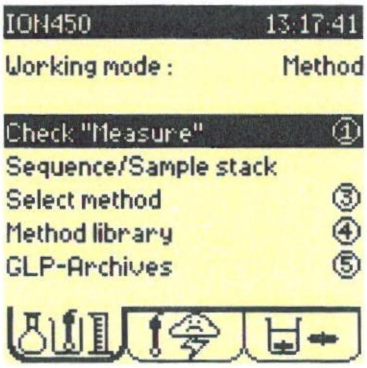
Check the frequency in the menu Configuration. See above to change the instrument configuration.

See also "Wrong pH reading values" in this section.

FlashLoader doesn't works on some old PC Labtop:

Change your PC for another one.

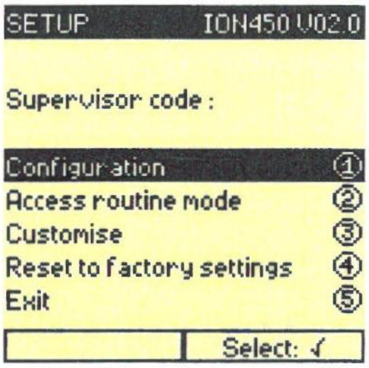
Your external keyboard does not comply with the ION450 setting or you have a configuration problem:



ION450 13:17:41

Working mode : Method

Press F12 on the external keyboard or the "stop key" for more than 3 seconds



SETUP ION450 V02.0

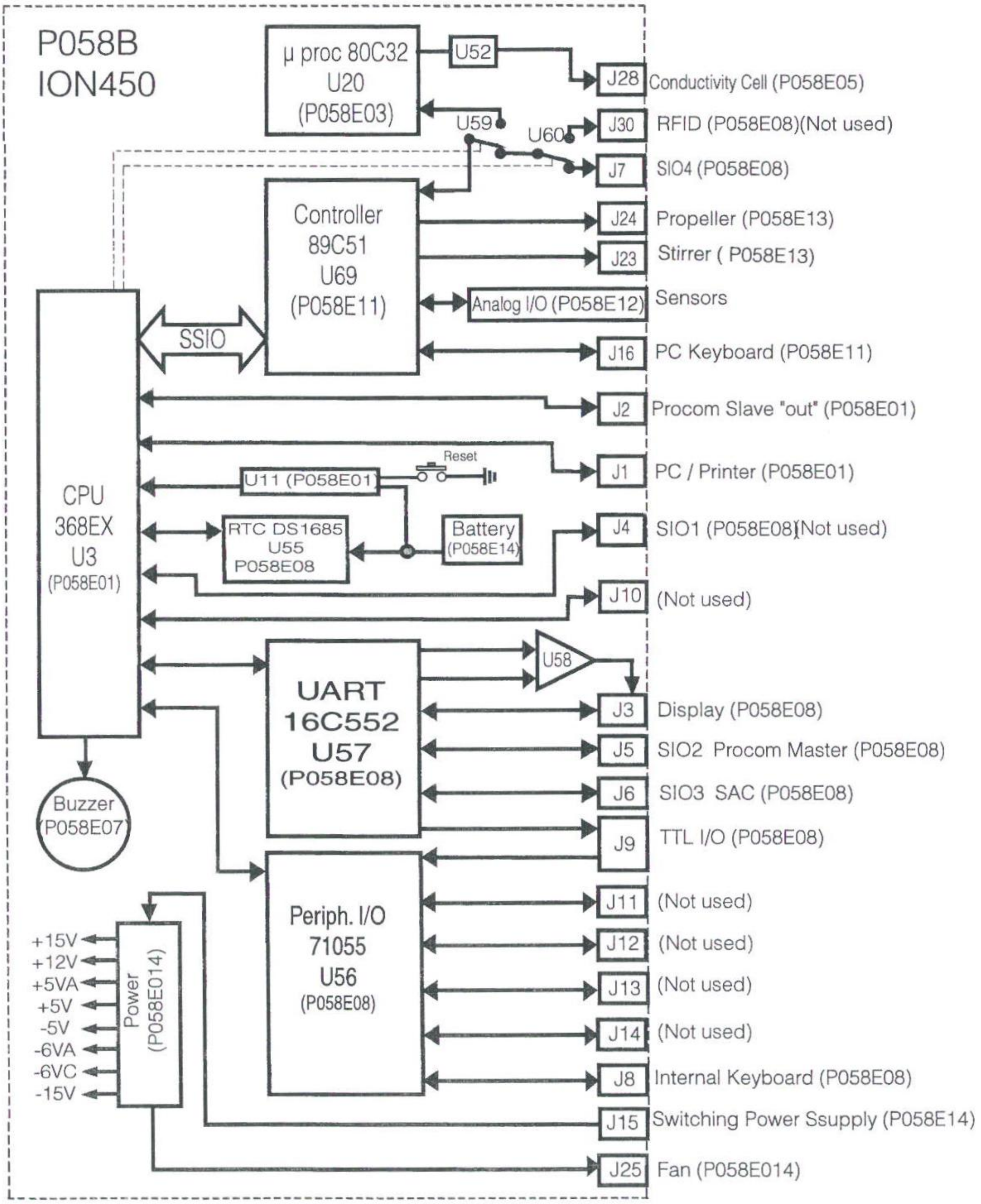
Supervisor code :

Configuration ①
Access routine mode ②
Customise ③
Reset to factory settings ④
Exit ⑤
Select: √

Select configuration and change the parameters.

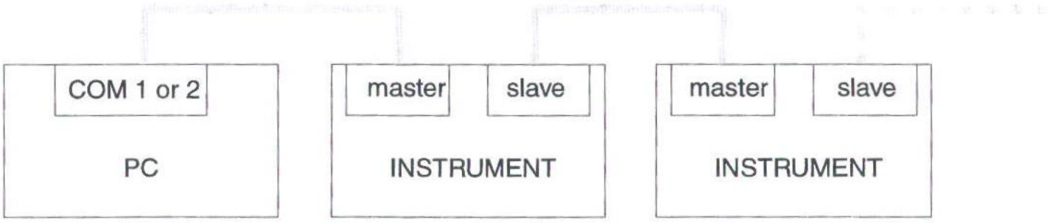
6. Electronics

A brief description of the main electronic functions is given in this section. A selection of the relevant electronic board schematics is included in section 7 "Drawings".


P058B
ION450
µ proc 80C32
U20
(P058E03)
U52
U59
U60
J28
Conductivity Cell (P058E05)
J30
RFID (P058E08)(Not used)
J7
SIO4 (P058E08)
Controller
89C51
U69
(P058E11)
J24
Propeller (P058E13)
J23
Stirrer (P058E13)
Analog I/O (P058E12)
Sensors
SSIO
J16
PC Keyboard (P058E11)
J2
Procom Slave "out" (P058E01)
Reset
U11 (P058E01)
J1
PC / Printer (P058E01)
CPU
368EX
U3
(P058E01)
RTC DS1685
U55
P058E08
Battery
(P058E14)
J4
SIO1 (P058E08)(Not used)
J10
(Not used)
U58
UART
16C552
U57
(P058E08)
J3
Display (P058E08)
J5
SIO2 Procom Master (P058E08)
J6
SIO3 SAC (P058E08)
J9
TTL I/O (P058E08)
Buzzer
(P058E07)
Periph. I/O
71055
U56
(P058E08)
J11
(Not used)
J12
(Not used)
J13
(Not used)
J14
(Not used)
J8
Internal Keyboard (P058E08)
+15V
+12V
+5VA
+5V
-5V
-6VA
-6VC
-15V
Power
(P058E014)
J15
Switching Power Ssupply (P058E14)
J25
Fan (P058E014)

Serial communication

Radiometer Analytical has developed a new communication protocol in order to enable the communication between a master (usually a PC) and up to 15 slaves (Radiometer Analytical instruments) in a daisy chain network. As a result, on each instrument, 2 serial communication ports are fitted, one master and one slave. The commands and answers are repeated along the chain until the proper addressee is identified.



The electrical circuit design between the master and the slave port is such that we can represent all the slave ports connected in parallel on a single communication line. This ensures communication between the master and each slave at the same top speed of 38.4 Kbps and with identical communication times. This multilayered protocol is embedded in a communication driver that has been integrated in our instruments firmware and also defined as a dynamic link library for our Windows based analytical software.

Electronics

The electronics consists of 3 electronic modules which are interconnected and connected to the rear panel.

1. The switching power supply.
2. The graphic display module.
3. The main board P058 where the 2 previous modules are connected.

1. The switching power supply

As this module is an external assembly, there is no description of it.

2. The display graphic module

As this module is an external assembly, there is no description of it.

3. The main board P058

This board includes

The main microprocessor 368EX
The conductivity microprocessor 80C32
Several internal power supplies, +15 V, +12 V; +5 V; -5 V, -6 V, -15 V
All the peripherals interconnections

The CPU part (386) P058E01 and P058E02.

In this part (micro controller 386 EX) is included the application software. The 16-bit address bus is used on the P058 board as a 8-bit bus (see schematic P058E01 and P058E07) lines P0 to P7.

- The P2.0, P2.1, P2.2, are direct ports to CPU386.
- The logic decoding addresses (IO-CS1 to IO-CS5) are written in the CPU386 board software.
- The CPU is addressing directly the procom slave output and the PC/Printer serial port.
- U11, is used as an instrument reset . T2 and his components attached are used to built the memory safety voltage.
- The SSIO extension part is controlled by the P89C51 controller (Schematic P058E011).
- Coming from the FPRG line (Flash program), the circuits T4, T3 send a +5 V to enable the Flash PROM U9.
- The CPU send the command to the switches to enable the CDM module or the RFID facility.(Schematic P058E08).

The conductivity CPU P058E03

The conductivity cell is controlled by a specific CPU 80C32 (U20). This microprocessor is controlled by the 89C51 (P058E11) via a switch U59 (P058E08).

U19 is used to reset the CPU.

The main clock1 (7.37 MHz) can be checked as described in this manual, section 4.

The conductivity clocks P058E04

The main clock2 (6 MHz) is used to built all the necessary clocks for conductivity measurements to select the correct range by the 3 lines GA0, GA and GA2.

The main clock2 (6.00 MHz) and the divided can be checked as described in this manual, section 4.

The conductivity cell interface P058E05

The Conductivity Module (CM) is initially designed to be included in a TIM8xx instrument to provide conductivity measurements.

The module is included in the P058 main board.

It includes it's own processing capability : microcontroller, ROM and RAM.

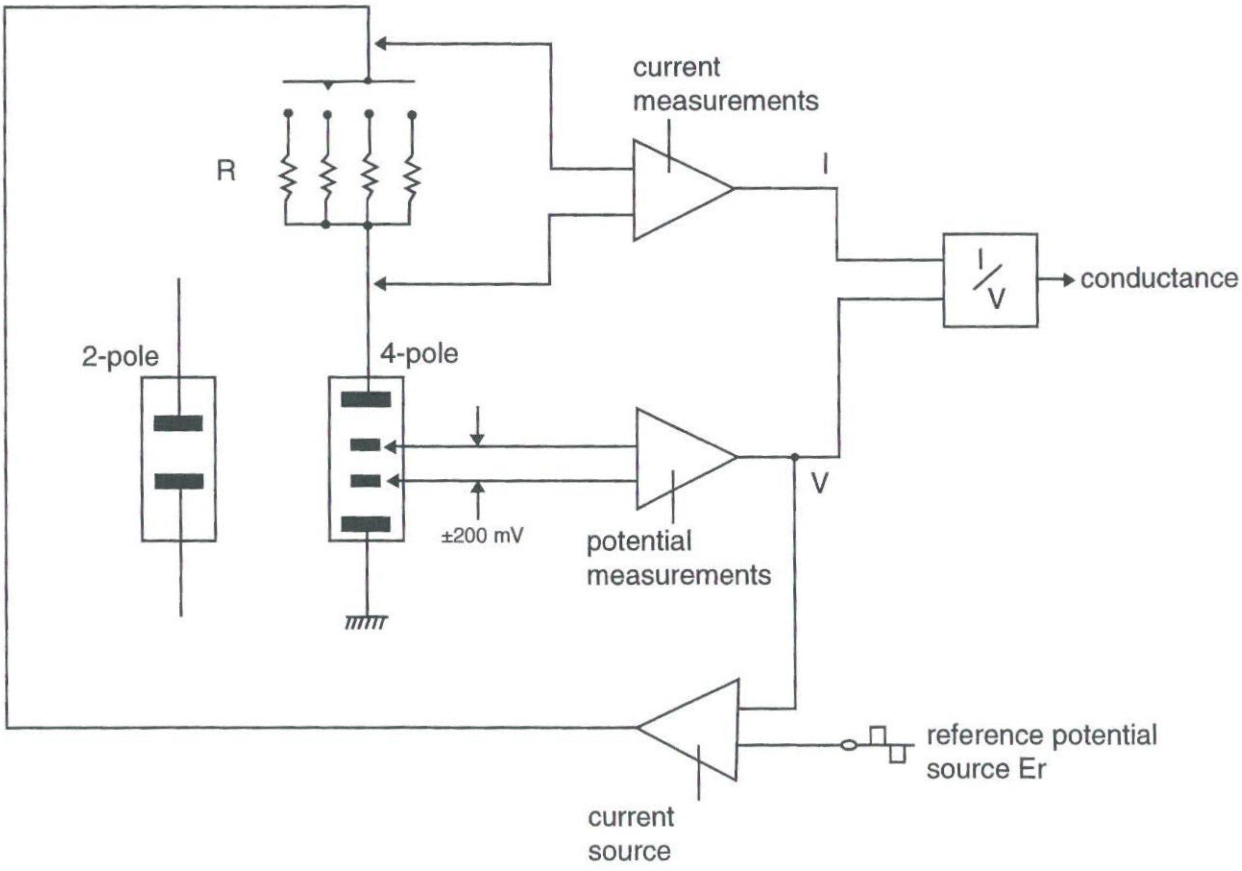
It communicates with the host instrument through a serial RS232 link.

Power for the module is supplied by the host.

The conductivity sensor is connected via a lockable DIN6 plug. A temperature probe can be included in the sensor.

Conductivity measurement principle :

- 4 poles measurement.
- Square wave signal.
- Potential (signal amplitude) is maintained constant between two "sense" electrodes, the current is being applied on two "active" electrodes.
- Signal amplitude between sense electrodes is ± 200mV.
- Both current I and potential V are measured to calculate the conductance I/V.
- Current and potential are sampled at the end of each half period of the signal, so that errors due to capacitance are reduced.


current
measurements
R
I
I/V
conductance
2-pole
4-pole
±200 mV
V
potential
measurements
reference potential
source Er
current
source

Note:

The current source is adjusted so that the amplitude of the E measured potential is equal to the amplitude of the Er reference potential (i.e. about ±200 mV).
Conductivity (at sample temperature) = (Cell constant) x (Conductance)

The conductivity Voltmeter P058E06

The signal coming from the U50A circuit is the temperature value or the Cell analogue signals.

The switches U50 used to choose the current, voltage or background signals coming from the cell ((P058E05) are directly controlled by the lines "I/V" and "C/Z" coming from the Conductivity microprocessor (P058E03).

The switches U51 used to choose the analog signals described above or ground are controlled by the lines "Pilot" and "Sample" built on the clock part (P058E04).

The signal going to the ship U52 is considered in a loop sequence. Tension, Current, Background and Temperature. The ship U52 integrates the full sequence and sends the signal to the 386 microprocessor via the 89C51 controller. The microprocessor calculates: "Current - Background / Voltage - Background = Conductivity".

The root schematics P058E07

3 distinct parts:

- One part directly controlled by the microprocessor 386 (through the extended bus or the 386 I/O)
- SSIO extension part, controlled by the P89C51.
- The different power supplies built on the main Bd.

The peripherals extensions P058E08

On the left, connectors coming from the CPU (drawing P058E01).

On the drawing main parts, all components controlled by the 386 parallel bus extension

a. RTC (Real Time Clock Calendar) which controls the date, clock and "1s" interruption.

b. UART circuit (U57 – 16C552) which controls:

    - 2 serial ports.
    - 1 centronic parallel port to control the graphic display signals and contrast,
    - TheTTL ports.
    - RTS and DTR output (U57 pin24 and 25) are used to control the display contrast.
    - RTS and DTR output (U57 pin11 and 12) from SIO3 are used to control both TTL (+5V and +12V) outputs. Typical lab external accessories can be connected on these outputs and through a relay. Pump, paper or pen recorder command, or any other external TTL-controlled accessories. No large current is available on these outputs and a relay is usually necessary.

c. PIO (U55) controls 2 burettes and the internal keyboard.
   - PA0 to PA3 get the 2 burettes low piston position optocoupler signal
   - PA4 to PA6 read the keyboard lines. The keyboard is a matriced one.
   - PA5 is a TTL input. Waiting for an external command, the ION450 can be synchronised with an external instrument. Enter this command in the method setup.
   - PB0 to PB7 transmit the piston and valve commands.
   - PC0 to PC7 read the keyboard columns.

SSIO General information P058E011 P058E012 P058E013

The SSIO extension comprises a P89C51 microprocessor. This microprocessor relieves the 386 microprocessor (drawing P058E01) from several tasks and handles the following by itself:

- External stirrer (propeller output)
- Internal stirrer
- E1, Ref, E2, Pt electrode analogue input and Temp.
- One RS232 (SSIO4)
- The conductivity microprocessor.
- External keyboard.

The P89C51 interconnection with the main 386CPU is made by a high-speed serial port (Serial Synchrony Input Output) which transmits all information to the 386CPU. In the opposite direction, the 386 sends commands to the P89C51 circuit.

The SSIO Extension to 8051 core P058E11

This is the sub-circuit controlled by the P89C51:

- Propeller (external stirrer)
- Stirrer
- DAC
- Pt
- ADC input (for electrode switching circuit)
- ADC (for electrodes analogue to digital signal conversion).

The four SIO synchronous links connect this circuit to the CPU386 present from the CPU 386. Each SSIO works with an individual clock. If a fault occurs in the link, none of the systems controlled by the P89C51 will operate. For example, no result on the display, no stirrer, no PC keyboard.

Situated on the inside of the P89C51 is the flash PROM, which contains the Radiometer Analytical software. The instrument software can be updated via the SIO4 link using the flash PROM. The socket, which is directly connected to the "Aux" on the rear panel, is used to reprogram the P89C51 circuit. Please note that, the Radiometer Analytical FlashLoader is not used to reprogram this circuit, for reprogramming purposes a "Philips" programme SI04 must be used. *The FlashLoader is used to reprogram the CPU386 chip.* See explanations given in the "Service Information" chapter.

The DAC controls the voltage for the platinum electrode associated with its circuit.

Output propeller for the Radiometer Analytical 12 VDC Stirrer Kit.

Analog inputs P058E012

- On the upper part, U70 is the platinum electrode command. The Digital/Analogue converter, U70 is a one-pole adjustable voltage. T29, associated with U71 inverts the voltage. U71 output is a dual-pole between -2000 mV to +2000 mV. U72 guarantees this adjustment. U72 is fed back by U74B or U75 amplifiers. U75 controls the voltage between the platinum electrode and the range resistor. It measures the current and also controls the current on the platinum electrode. U74 is directly connected to the platinum electrode. With U74, this electrode is directly under voltage control.
- The 4 range resistors R240 (1Kohm for 1mA) to R237 (1Mohm for 1µA) are selected using the U76 switch.
- 2 transistors T30 and T31 form a zener diode with a very low leak current, limiting the U74A input voltage.
- The relay RE1B is used to isolate the platinum electrode.
- U77 (MAX191) is an output reference voltage (5ppm/°C and +/-0.1%).
- U78 output value is 2.048V+/-2mV. U78 is only present to deliver more current than U77. The 2.048VDC reference voltage is used for the platinum electrode, the temperature cell and the ADC U79 circuit.
- The U79 ADC single polarity circuit is connected using a high-speed serial line to the P89C51. CS, SK, SDIO are the signals used in this serial line. When data is ready, the ADC-RDY line transmits the information to the P89C51 circuit. Coming from the P89C51, ADC-CLK is the 2MHz clock converter . Due to the fact that this circuit is a single polarity one, amplifiers U80A and U80B are added to the output using the 2 resistors R251 and R252.
- U80A and U80B amplifiers linearise the system response from –2 V to + 2 V. Adding at the summing point the reference DC voltage, the ADC U79 input voltage range is between 0 and +4 VDC.
- U81 controls the input channels. Always switching the inputs (Temp, E1, Ref, E2, Background) to transfer the data, U81 is directly controlled by the 3 channels A to C. The application software defines the switching order.
- The temperature cell is equivalent to an adjustable resistor. R257 and temp cell make a divider bridge. The reference voltage 2.048 VDC, which is directly proportional to the temperature cell resistance, is applied via the intermediate U84 to the circuit changing switch U81.
- U82B, U83A and U82A are high impedance amplifiers and are protected by a 10Kohm resistor.
- As U83B works like the 3 other amplifiers, and controls the input impedance with respect to the environment temperature. The value read at pin number 3 of the U81 is subtracted from the other input data, increasing the data stability with the temperature variations.
- The Ref-Hz line from the P89C51 directly controls the relay RE2B. When E2 is open, measurements are made in differential mode; when E2 is closed, measurements are made in non-differential mode.

The stirrers P058E013

This circuit controls the internal and external stirrers.

As for the burettes, the internal stirrer is controlled by a step-by-step motor. Rotation is in the range of 100 RPM to 1100 RPM with 50 RPM steps available from the keyboard.

- The integrated circuit (U86) controls the motor (4 poles, 24 positions/rpm). The pilot circuit is calculated for short or open circuit motors.
- Sens1 and Sens2 input resistors fix the motor self-current.
- RC-1 and RC-2 input resistors fix the motors self-chop current.
- Phase 1 and phase 2 inputs control the rotating period.
- On the right hand side of the diagram is a drawing of the external stirrer. The stirrer speed is controlled on the stirrer itself and T35 only sends 12 VDC as a software controlled power supply. The line command, coming from the P89C51 is PRP-on, on the T36 transistor. The resistors R264 to R266 limit the 12 VDC output current. On the command line PRP-on, the P89C51 regularly sends the "on" command for a few µ seconds, to check that the stirrer is present. When the stirrer is present, the socket switch (J24 pin 1 and 3) is connected and +12V is on the R268 resistor. T37 sends information to P89C51: 0 for external stirrer not connected and 1 for external stirrer connected.

The power P058E014

These are the power supplies.

- +15 VDC, coming from the switching power supply and is used for motors, display contrast and pump circuits.
- +12 VDC, made by +15 VDC and is used for the propeller and 12 V TTL output.
- -6 VA, made by -15 VDC and is used for the analogue part.
- +5 VA, coming from the switching power supply and is used for the analogue part.
- -5 VDC, made by -15 VDC and is used for the RS232.
- -15 VDC, coming from the switching power supply and is used for display contrast and pump circuits.
- +5 VDC, coming from the switching power supply and is used for all the logic circuits.

7. Drawings

RS232 interface cable wiring

Interface cable Titration Manager to PC	102
Interface cable Titration Manager to Printer	103
Interface cable Titration Manager to Kyoline MTP640 Printer	104
Interface cable Titration Manager to SAC 80/90	105

ION450 drawings

Rear panel interconnections		106
Main board, Component layout	A058D54B	107
CPU 386EX	P058E01B	108
RAM BANK-1	P058E02B	109
CPU conductivity module	P058E03B	110
Clock	P058E04B	111
Cell interface	P058E05B	112
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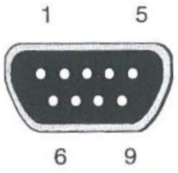
Analog inputs	P058E12B	117
Stirrers	P058E13B	118
Power	P058E14B	119

Connection of a PC

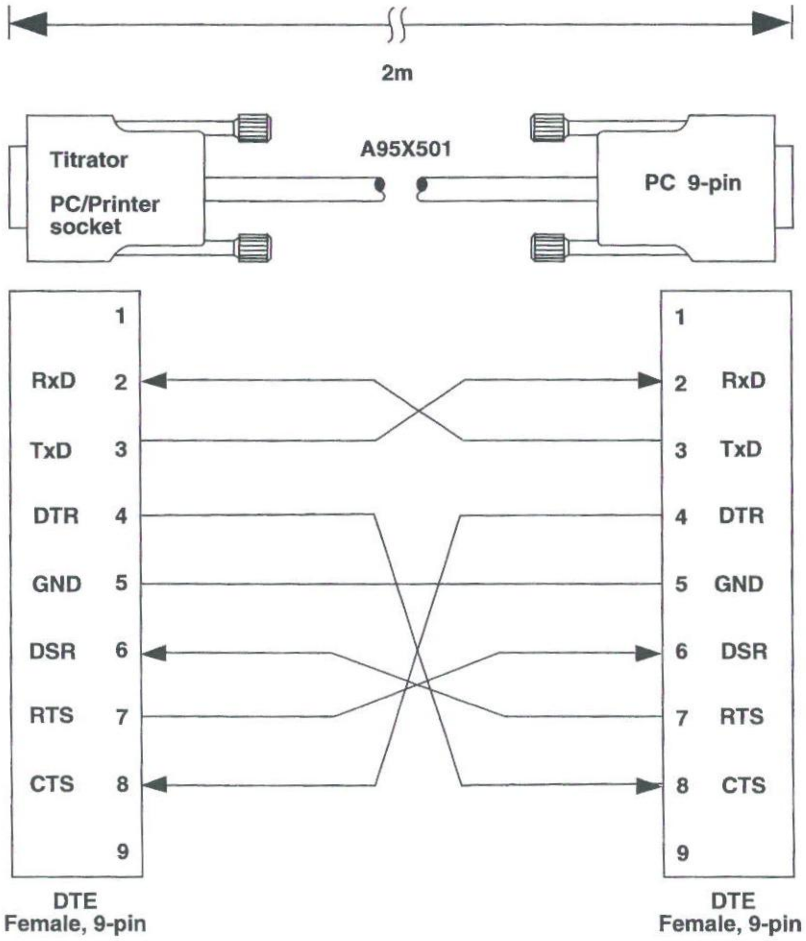
RS232C Specifications: 9-pin, Sub D-connector

Pin connections:



1. No connection
2. Receiving Data (input) : RxD
3. Transmitted Data (outut) : TxD
4. Data Terminal Ready (output) : DTR
5. Masse : GND
6. Non connecté : DSR
7. Request to Send (output): RTS
8. Clear to Send (input) : CTS
9. No connection

For the connection of a personal computer, use the cable, 9-9 pin part number A95X501.


2m
A95X501
Titrator
PC/Printer socket
PC 9-pin
1
RxD 2
TxD 3
DTR 4
GND 5
DSR 6
RTS 7
CTS 8
9
1
2 RxD
3 TxD
4 DTR
5 GND
6 DSR
7 RTS
8 CTS
9
DTE
Female, 9-pin
DTE
Female, 9-pin

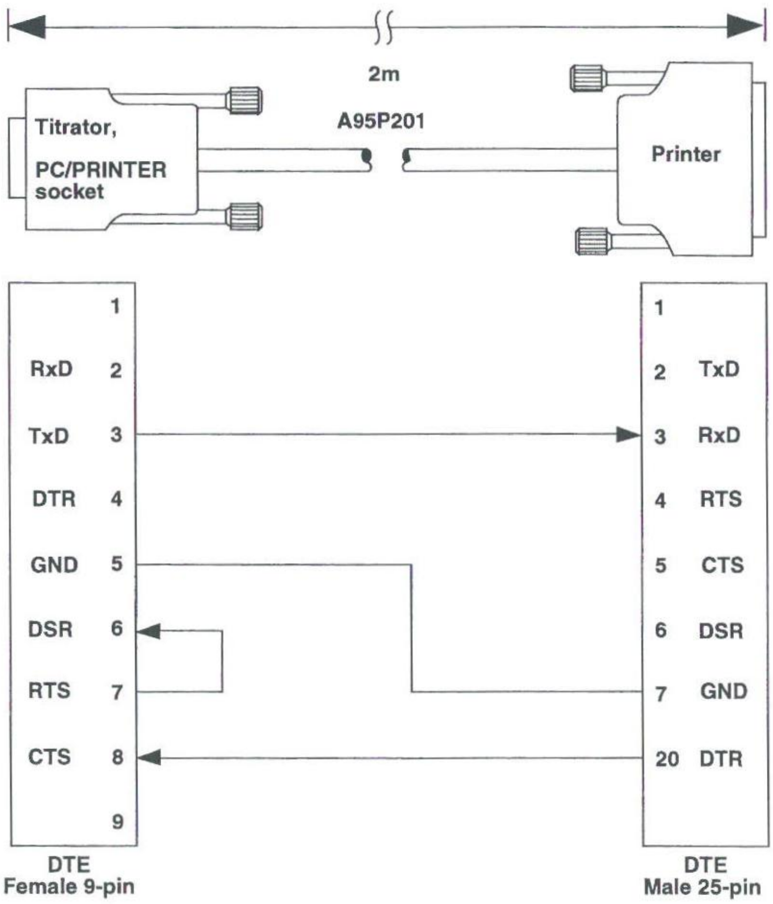
Connection of a Printer

For the connection of a printer, use the cable, 9-25 pin, part no. A95P201.

The printer must have the following characteristics for connection to the Titration Manager:

- Printer, 40 or 80 characters.
- RS232C: 9600 baud, 8 data bits, no parity, 1 stop bit.
- Flux control via the DTR line (pin 20 on the 25-pin plug).
- Printout of tables
- IBM fonts, 8 bits

Note
The printer and the number of characters must be programmed in the Setup menu.


2m
A95P201
Titrator,
PC/PRINTER
socket
Printer
1
RxD 2
TxD 3
DTR 4
GND 5
DSR 6
RTS 7
CTS 8
9
1
2 TxD
3 RxD
4 RTS
5 CTS
6 DSR
7 GND
20 DTR
DTE
Female 9-pin
DTE
Male 25-pin

Interface cable to Kyoline MTP640 Printer

For the connection of a printer, use the cable, 9-6 pin, part no. A95X506.

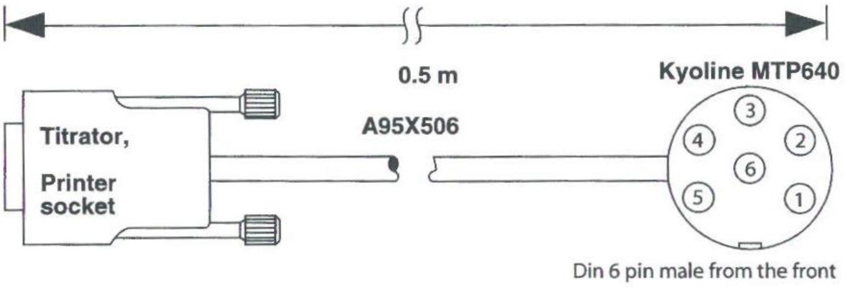
The printer must have the following characteristics for connection to the Titration Manager

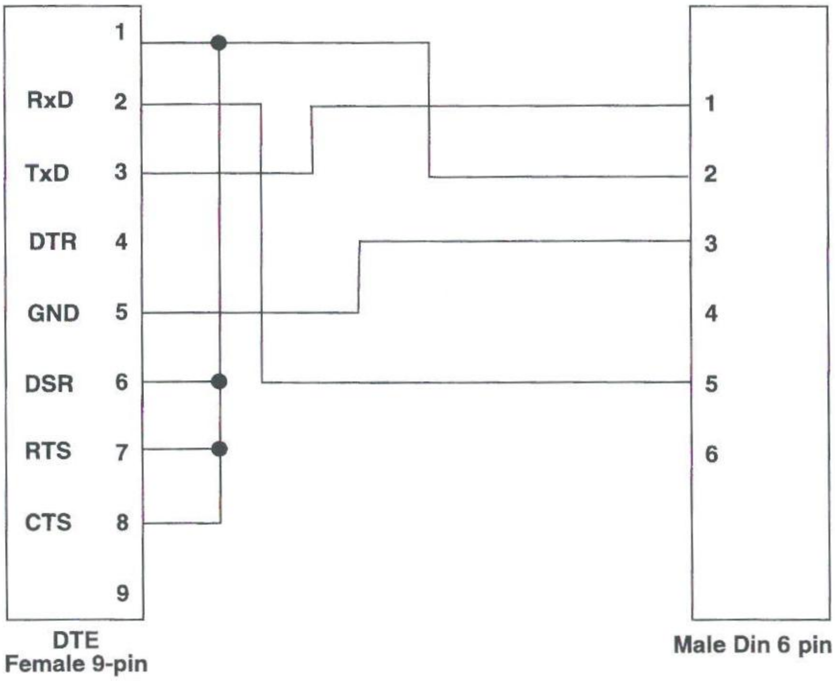
Dip switch setting: 1 2 3 4 5 6 7 8
1 1 0 0 1 0 1 0 off = 0; on =1

RS232C: 9600 baud, 8 data bits, no parity, 1 stop bit.

Mode Epson 80 dots /line

CR = CR (Not CR + LF)


0.5 m
Kyoline MTP640
Titrator,
Printer socket
A95X506
3
4
2
6
5
1
Din 6 pin male from the front

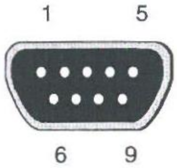

1
RxD 2
TxD 3
DTR 4
GND 5
DSR 6
RTS 7
CTS 8
9
DTE
Female 9-pin
1
2
3
4
5
6
Male Din 6 pin

Connection of a Sample Changer (SAC80/SAC90)

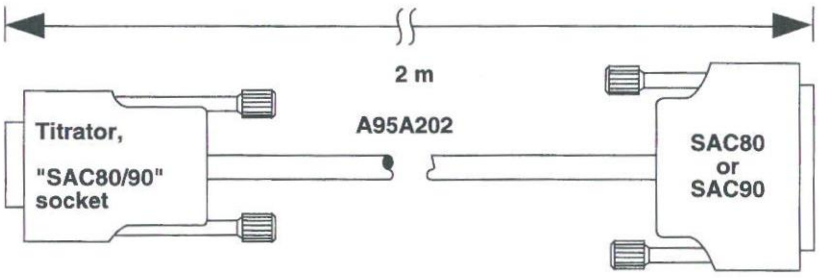
For the connection of a SAC80 or SAC90, use the cable 9-25 pin (A95A202).

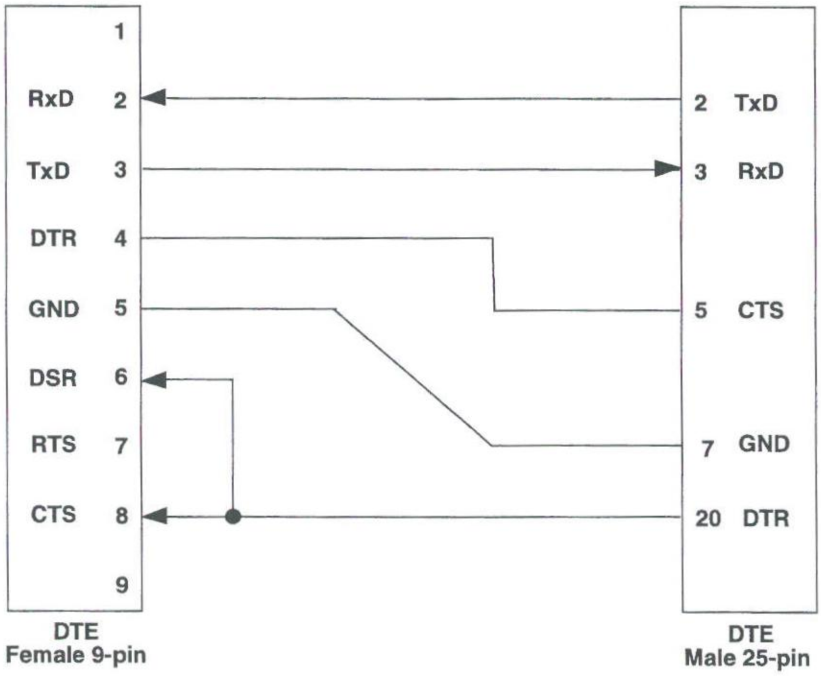
RS232C Specifications: 9-pin, sub D-connector: 2400 baud, even parity, 7 data bits, 1 stop bit

Pin connections:



1. No connection
2. Receiving Data (input) : RxD
3. Transmitted Data (output) : TxD
4. Data Terminal Ready (output) : DTR
5. Ground : GND
6. Data set ready : DSR (input)
7. No connection
8. Clear to Send (input) : CTS
9. No connection


2 m
A95A202
Titrator,
"SAC80/90"
socket
SAC80
or
SAC90


1
RxD 2
TxD 3
DTR 4
GND 5
DSR 6
RTS 7
CTS 8
9
DTE
Female 9-pin
2 TxD
3 RxD
5 CTS
7 GND
20 DTR
DTE
Male 25-pin

Connection of the electrodes

To E1 or E2

Combined pH electrodes with or without temperature sensor
Example:
pHC2001, pHC2011, pHC2085, pHC2401, pHC2501, pHC2601, pHC3001, pHC3011, pHC3081, pHC3185, pHC4000.

Single pH electrodes
Examples:
pHG201, pHG301

Combined metal electrodes (Redox measurements)
Example**:
MC3051Pt

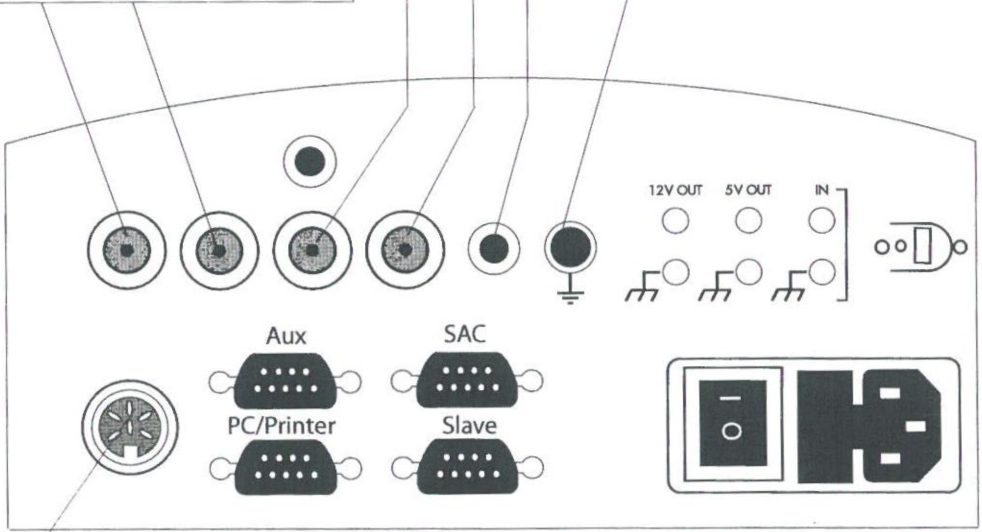
Single or combined ion selective electrodes
Examples*:
ISEC301F, ISE25Ca, ISE25Cl, ISE25Cu, ISE25F, ISE25NO3, ISE25Pb, ISE25S

Reference electrodes
Examples:
REF201**, REF421*, REF401**, REF251**, REF601**, REF621*, REF321*, REF361

Double platinum electrodes
Example:
M231Pt2 ***, M241Pt2-8

Temperature sensors
Example:
T201

Simple metal electrodes
Example:
M241Pt

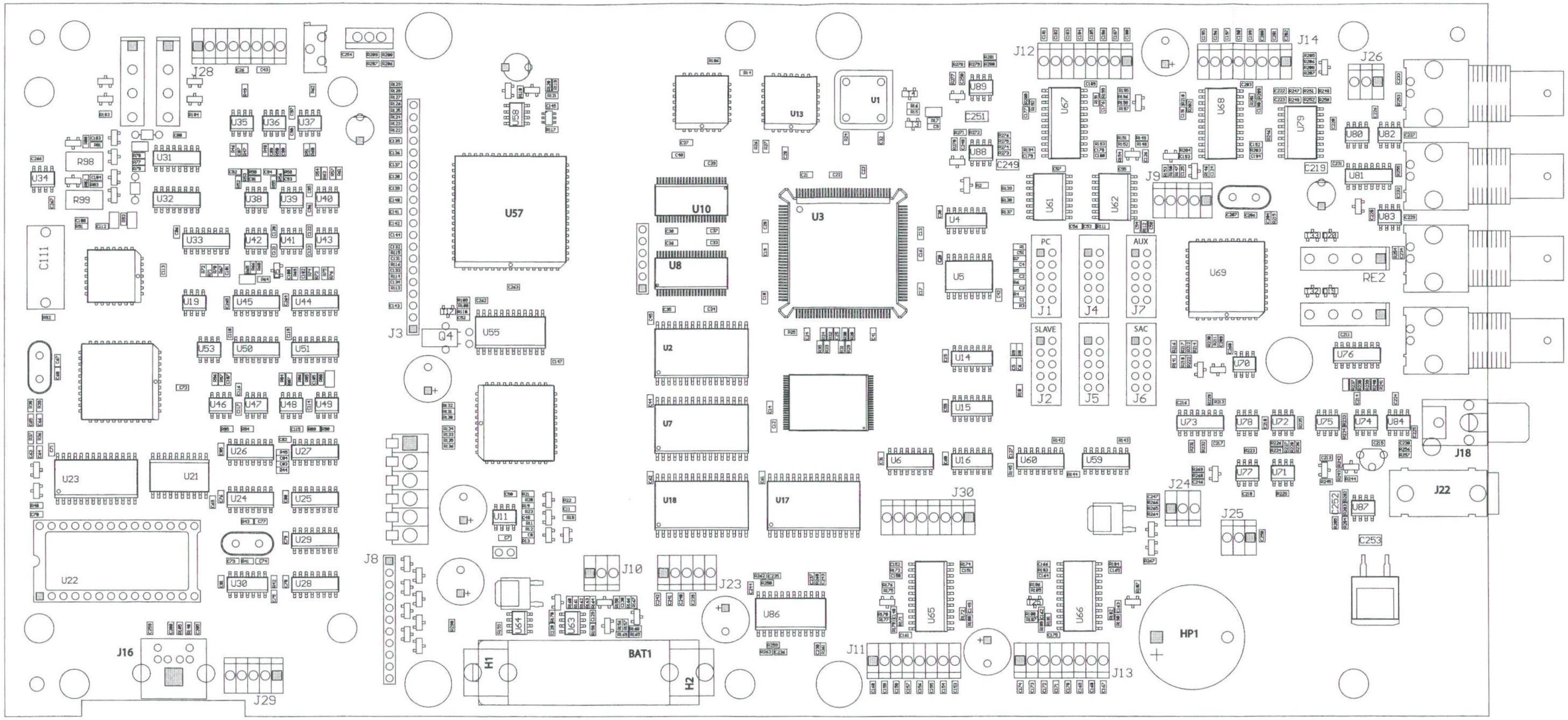


Conductivity cell
Example:
CDC741T

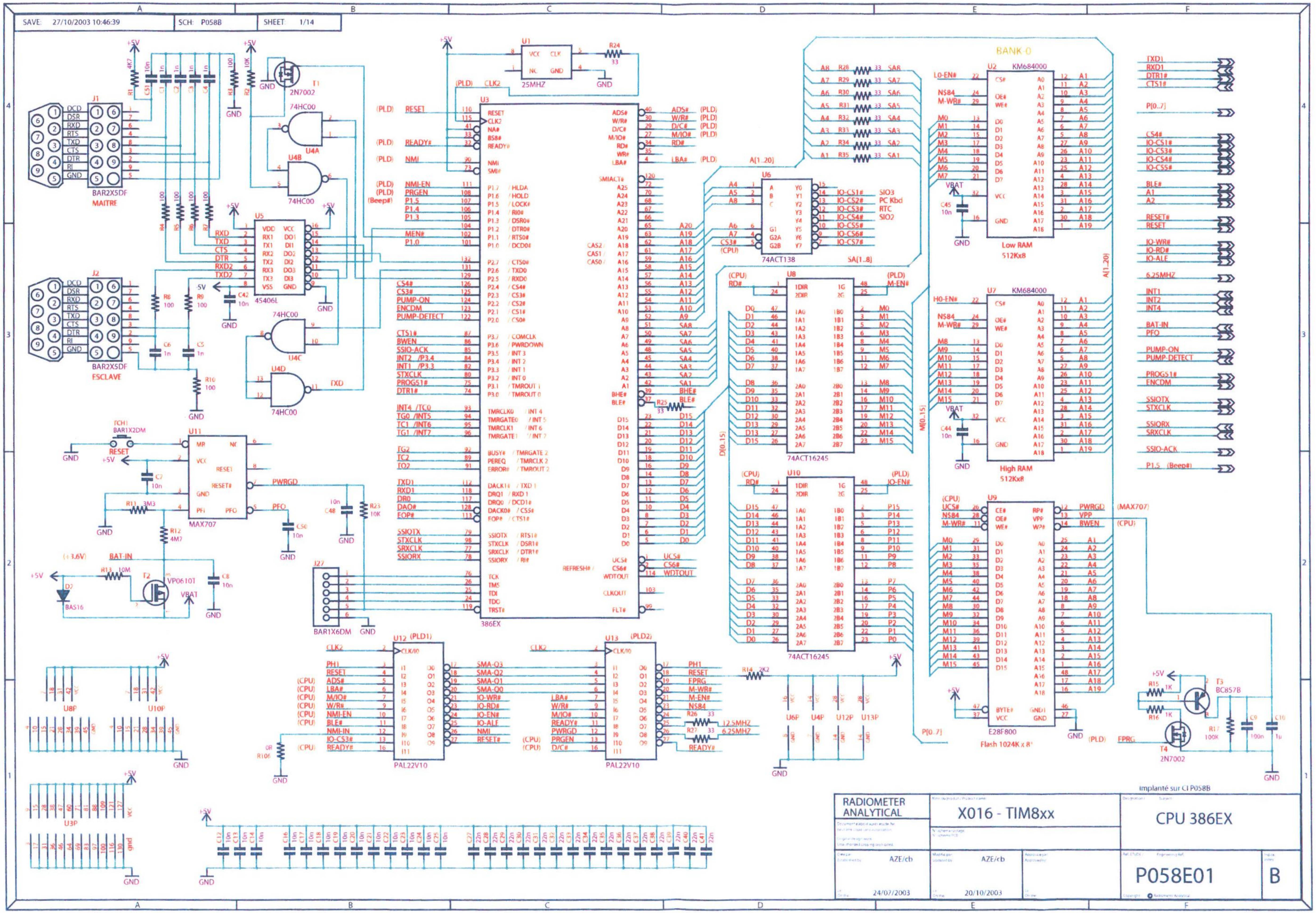
* Use electrode cable, part no. A94L114

** Use plug adapter 2 banana plugs/1BNC, part no. A94P801

*** Use plug adapter 1 banana plug/1BNC, part no. A94P807


J28
J3
J8
J16
J29
U57
U55
Q4
U10
U8
U2
U7
U18
U17
U3
U1
U13
U58
U11
U63
U64
J10
J23
U86
BAT1
H1
H2
U22
U23
U21
U31
U32
U33
U34
U35
U36
U37
U38
U39
U40
U41
U42
U43
U44
U45
U19
U53
U50
U51
U46
U47
U48
U49
U26
U27
U24
U25
U29
U30
U28
R98
R99
C111
J12
J14
J26
U89
U88
C251
C249
U67
U68
U79
U80
U82
U81
U83
C219
J9
U61
U62
U4
U5
PC
J1
J4
AUX
J7
SLAVE
J2
J5
SAC
J6
U69
RE2
U14
U15
U70
U76
U6
U16
U60
U59
U73
U78
U72
U75
U74
U84
U77
U71
J18
J22
J24
J25
U87
C252
C253
J30
U65
U66
J11
J13
HP1

RADIOMETER ANALYTICAL Document elabore apres etude. Ne peut etre copie sans autorisation. Original design work. Unthorized copying prohibited.	Nom du produit P058 Indice CI B		Designation Composants face SUPERIEURE	
Cree par AZ Le 27-10-2003	Modifie par AZ Le 27-10-2003	Approuve par PLE Le 27-10-2003	Ref. ETUDE A058D54	Indice B


SAVE: 27/10/2003 10:46:39
SCH: P058B
SHEET: 1/14
J1
BAR2X5DF
MAITRE
J2
BAR2X5DF
ESCLAVE
DCD
DSR
RXD
RTS
TXD
CTS
DTR
RI
GND
U5
45406L
U4A
U4B
U4C
U4D
74HC00
T1
2N7002
U1
25MHZ
U3
386EX
U11
MAX707
RESET
PWRGD
PFO
BAT-IN
T2
VP0610T
D2
BAS16
J27
BAR1X6DM
TCH1
BAR1X2DM
U6
74ACT138
U8
74ACT16245
U10
74ACT16245
BANK 0
U2
KM684000
Low RAM
512Kx8
U7
KM684000
High RAM
512Kx8
U9
E28F800
Flash 1024K x 8
U12 (PLD1)
PAL22V10
U13 (PLD2)
PAL22V10
12.5MHZ
6.25MHZ
T3
BC857B
T4
2N7002
U8P
U10P
U3P
U6P
U4P
U12P
U13P
A[1..20]
SA[1..8]
D[0..15]
M[0..15]
P[0..7]
IO-CS1#
IO-CS2#
IO-CS3#
IO-CS4#
IO-CS5#
IO-CS6#
IO-CS7#
SIO3
PC Kbd
RTC
SIO2
TXD1
RXD1
DTR1#
CTS1#
CS4#
BLE#
A1
A2
RESET#
IO-WR#
IO-RD#
IO-ALE
6.25MHZ
INT1
INT2
INT4
BAT-IN
PFO
PUMP-ON
PUMP-DETECT
PROGS1#
ENCDM
SSIOTX
STXCLK
SSIORX
SRXCLK
SSIO-ACK
P1.5 (Beep#)
GND
+5V
VBAT
implanté sur CI P058B

RADIOMETER
ANALYTICAL

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Nom du produit / Product name: X016 - TIM8xx

N° schéma routage / N° schéma PCB

Désignation / Subject: CPU 386EX

Créé par / Established by: AZE/cb
Le / On the: 24/07/2003

Modifié par / Updated by: AZE/cb
Le / On the: 20/10/2003

Approuvé par / Approved by:
Le / On the:

Réf. ÉTUDE / Engineering Ref.: P058E01

Indice / Index: B

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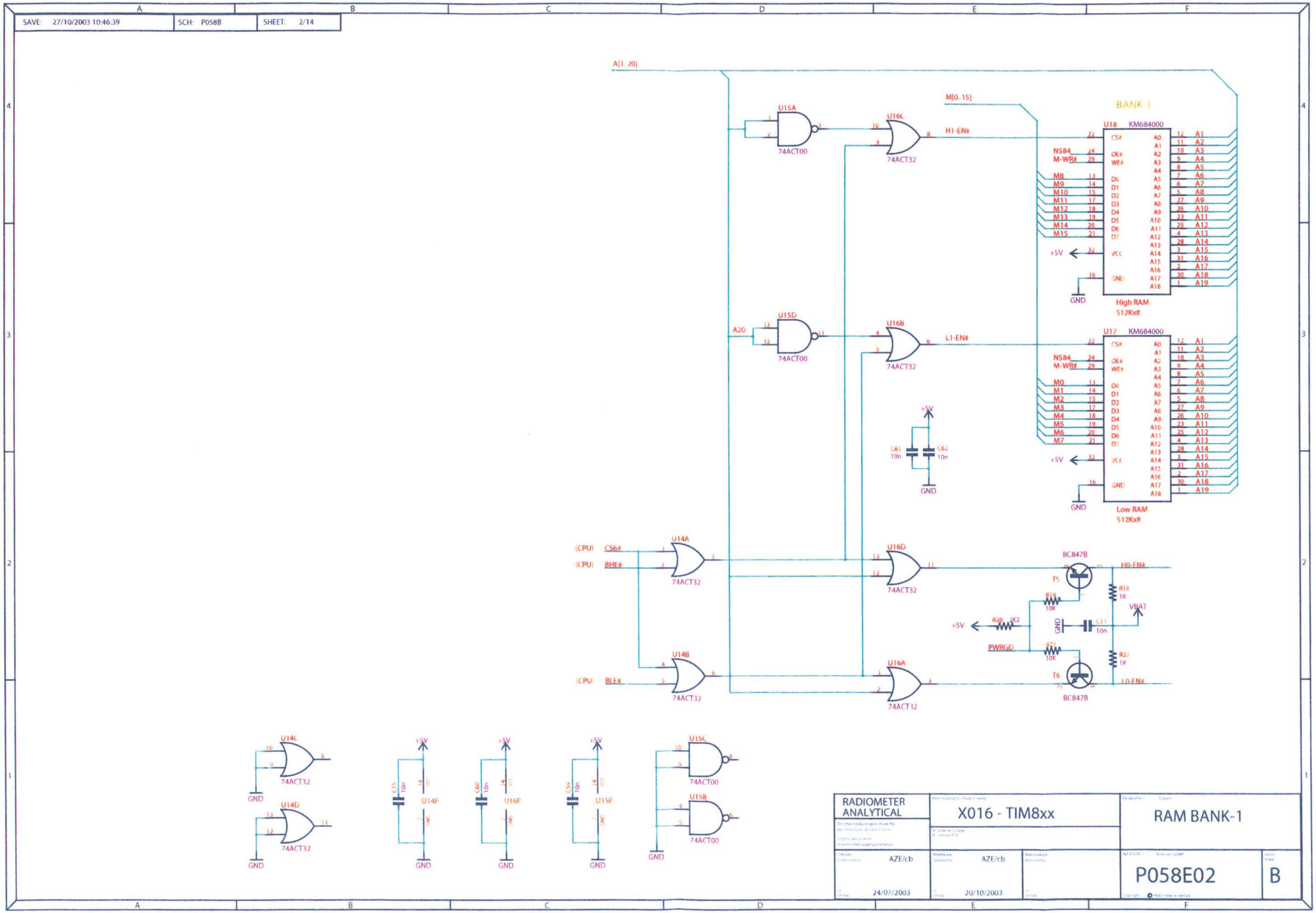
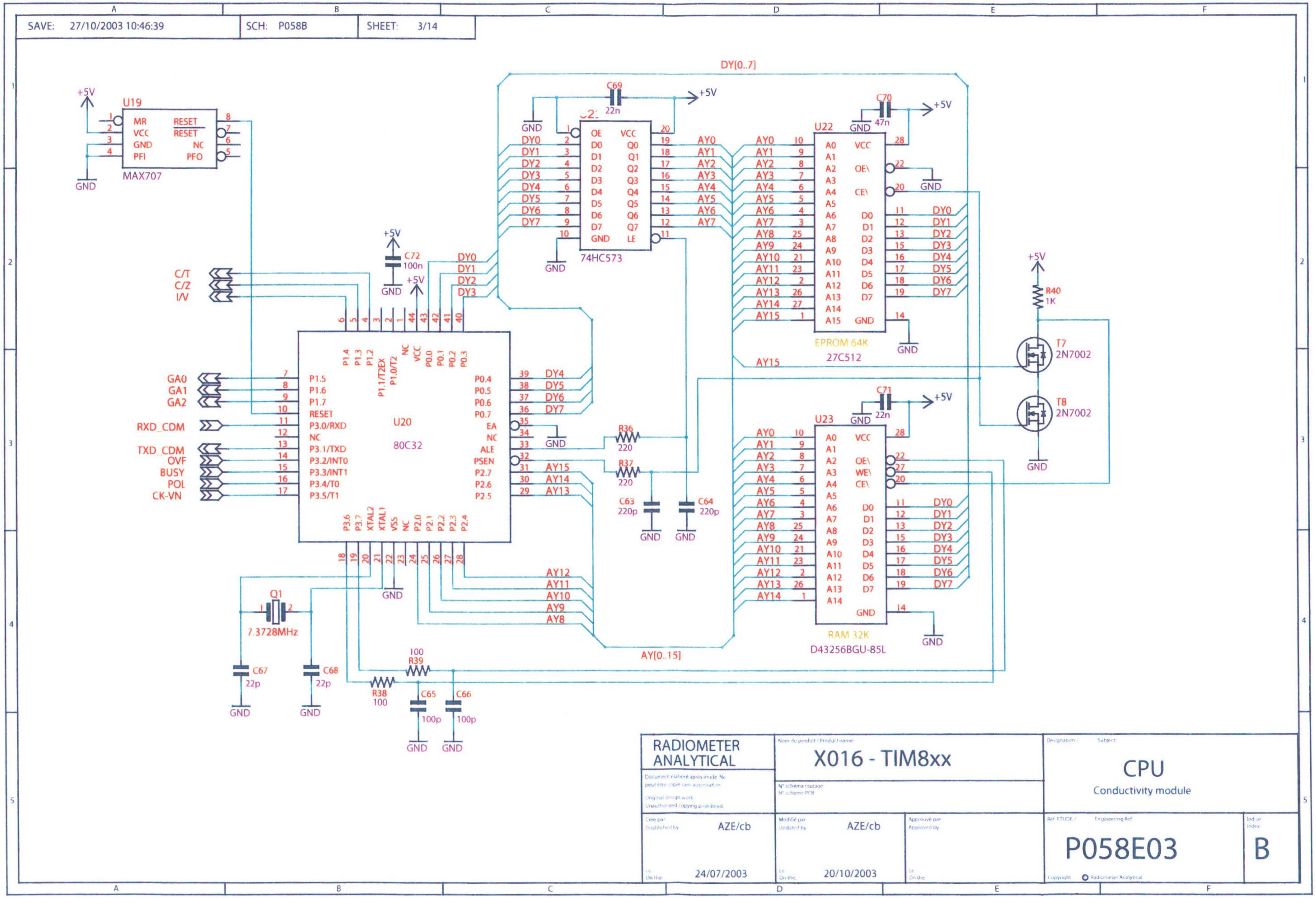

SAVE: 27/10/2003 10:46:39
SCH: P058B
SHEET: 2/14
A[1..20]
M[0..15]
BANK 1
U15A
74ACT00
U16C
74ACT32
H1-EN#
U18 KM684000
CS#
OE#
WE#
NS84
M-WR#
M8
M9
M10
M11
M12
M13
M14
M15
D0
D1
D2
D3
D4
D5
D6
D7
VCC
GND
+5V
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
High RAM
512Kx8
U15D
A20
U16B
L1-EN#
U17 KM684000
M0
M1
M2
M3
M4
M5
M6
M7
Low RAM
512Kx8
C61
10n
C62
10n
(CPU) CS6#
(CPU) BHE#
(CPU) BLE#
U14A
U14B
U16D
U16A
BC847B
T5
T6
H0-EN#
L0-EN#
R18
1K
R19
10K
R20 2K2
R21
10K
R22
1K
C11
10n
VBAT
PWRGD
U14C
U14D
C15
C60
C59
U14P
U16P
U15P
U15C
U15B
RADIOMETER ANALYTICAL
X016 - TIM8xx
RAM BANK-1
Established by AZE/cb
On the 24/07/2003
Updated by AZE/cb
On the 20/10/2003
Approved by
Engineering Ref
P058E02
Index
B

SAVE: 27/10/2003 10:46:39 SCH: P058B SHEET: 3/14


DY[0..7]
AY[0..15]
U19
MAX707
MR
VCC
GND
PFI
RESET
NC
PFO
+5V
GND
C69
22n
C70
47n
C71
22n
C72
100n
U21
74HC573
OE
D0
D1
D2
D3
D4
D5
D6
D7
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
LE
U22
EPROM 64K
27C512
U23
RAM 32K
D43256BGU-85L
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
OE\
CE\
WE\
U20
80C32
P1.5
P1.6
P1.7
RESET
P3.0/RXD
NC
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P0.4
P0.5
P0.6
P0.7
EA
ALE
PSEN
P2.7
P2.6
P2.5
P1.4
P1.3
P1.2
P1.1/T2EX
P1.0/T2
P0.0
P0.1
P0.2
P0.3
P3.6
P3.7
XTAL2
XTAL1
VSS
P2.0
P2.1
P2.2
P2.3
P2.4
C/T
C/Z
I/V
GA0
GA1
GA2
RXD_CDM
TXD_CDM
OVF
BUSY
POL
CK-VN
R36
220
R37
220
C63
220p
C64
220p
R38
100
R39
100
C65
100p
C66
100p
Q1
7.3728MHz
C67
22p
C68
22p
R40
1K
T7
2N7002
T8
2N7002

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ANALYTICAL

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Nom du produit / Product name
X016 - TIM8xx

N° schéma routage
N° schema PCB

Désignation / Subject
CPU
Conductivity module

Crée par / Established by: AZE/cb
Le / On the: 24/07/2003

Modifié par / Updated by: AZE/cb
Le / On the: 20/10/2003

Approuvé par / Approved by
Le / On the

Réf. ETUDE / Engineering Ref
P058E03

Indice / Index
B

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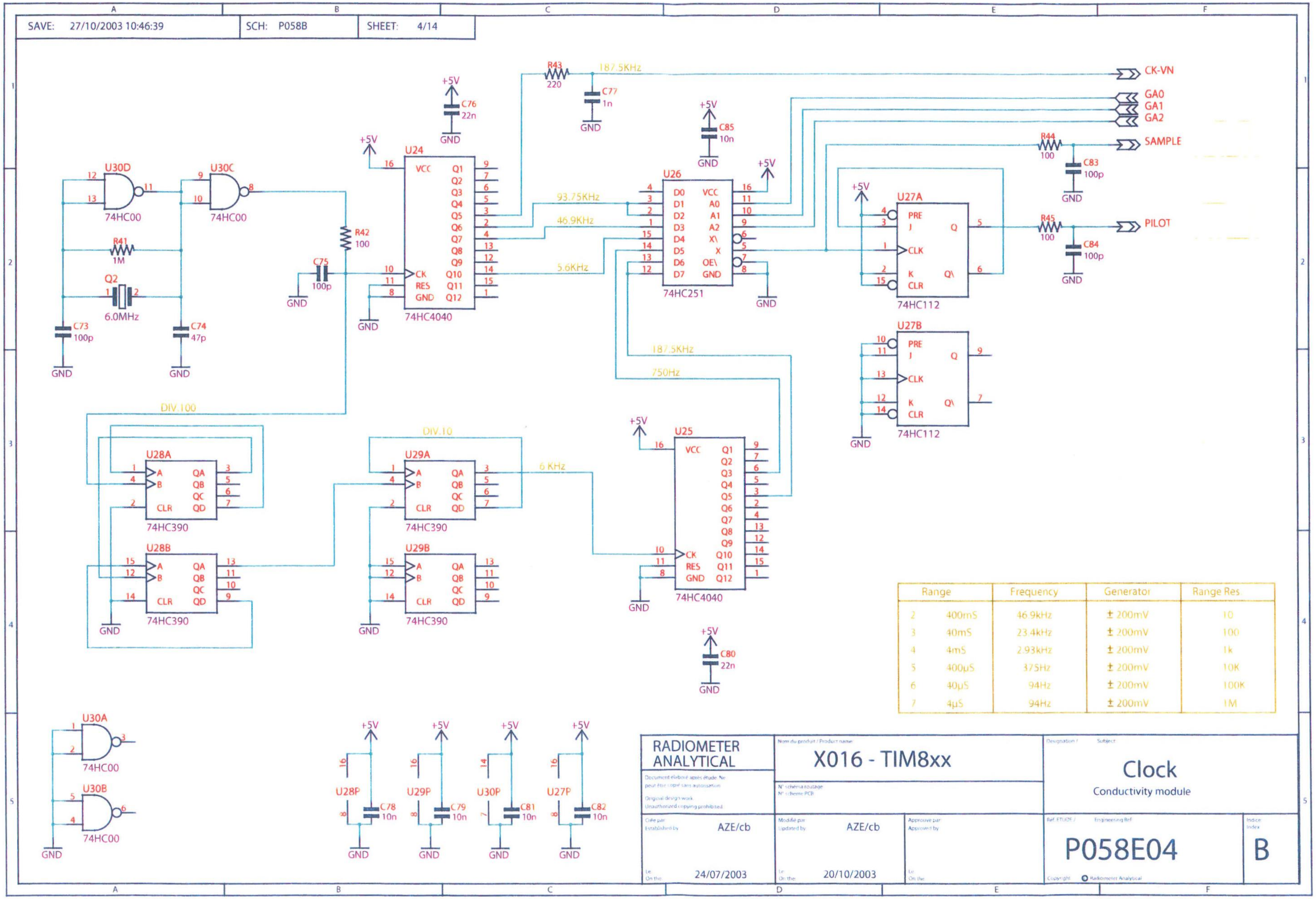
SAVE: 27/10/2003 10:46:39 | SCH: P058B | SHEET: 4/14



A
B
C
D
E
F
1
2
3
4
5
U30D
U30C
74HC00
R41
1M
Q2
6.0MHz
C73
100p
C74
47p
GND
R42
100
C75
100p
+5V
C76
22n
U24
VCC
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
CK
RES
GND
74HC4040
R43
220
187.5KHz
C77
1n
93.75KHz
46.9KHz
5.6KHz
C85
10n
U26
D0
D1
D2
D3
D4
D5
D6
D7
VCC
A0
A1
A2
X\
X
OE\
GND
74HC251
CK-VN
GA0
GA1
GA2
R44
100
C83
100p
SAMPLE
U27A
PRE
J
CLK
K
CLR
Q
Q\
74HC112
R45
100
C84
100p
PILOT
U27B
187.5KHz
750Hz
DIV.100
DIV.10
6 KHz
U28A
U28B
U29A
U29B
QA
QB
QC
QD
74HC390
U25
74HC4040
C80
22n
U30A
U30B
U28P
U29P
U30P
U27P
C78
10n
C79
10n
C81
10n
C82
10n

Range		Frequency	Generator	Range Res
2	400mS	46.9kHz	± 200mV	10
3	40mS	23.4kHz	± 200mV	100
4	4mS	2.93kHz	± 200mV	1k
5	400µS	375Hz	± 200mV	10K
6	40µS	94Hz	± 200mV	100K
7	4µS	94Hz	± 200mV	1M

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Nom du produit / Product name: X016 - TIM8xx

N° schéma routage
N° scheme PCB

Designation / Subject: Clock
Conductivity module

Crée par
Established by: AZE/cb
Le
On the: 24/07/2003

Modifié par
Updated by: AZE/cb
Le
On the: 20/10/2003

Approuvé par
Approved by
Le
On the

Ref. ETUDE / Engineering Ref: P058E04

Indice
Index: B

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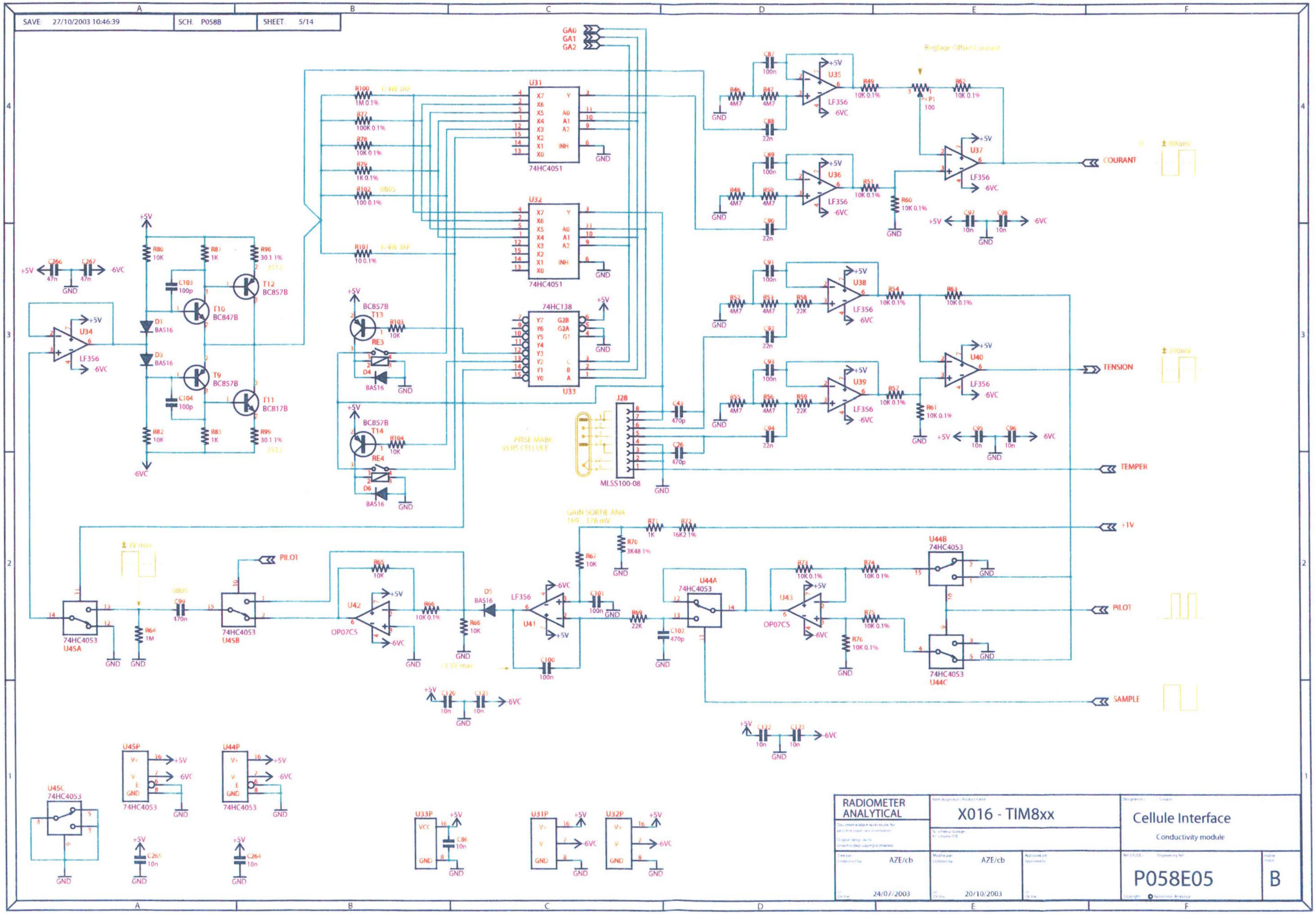
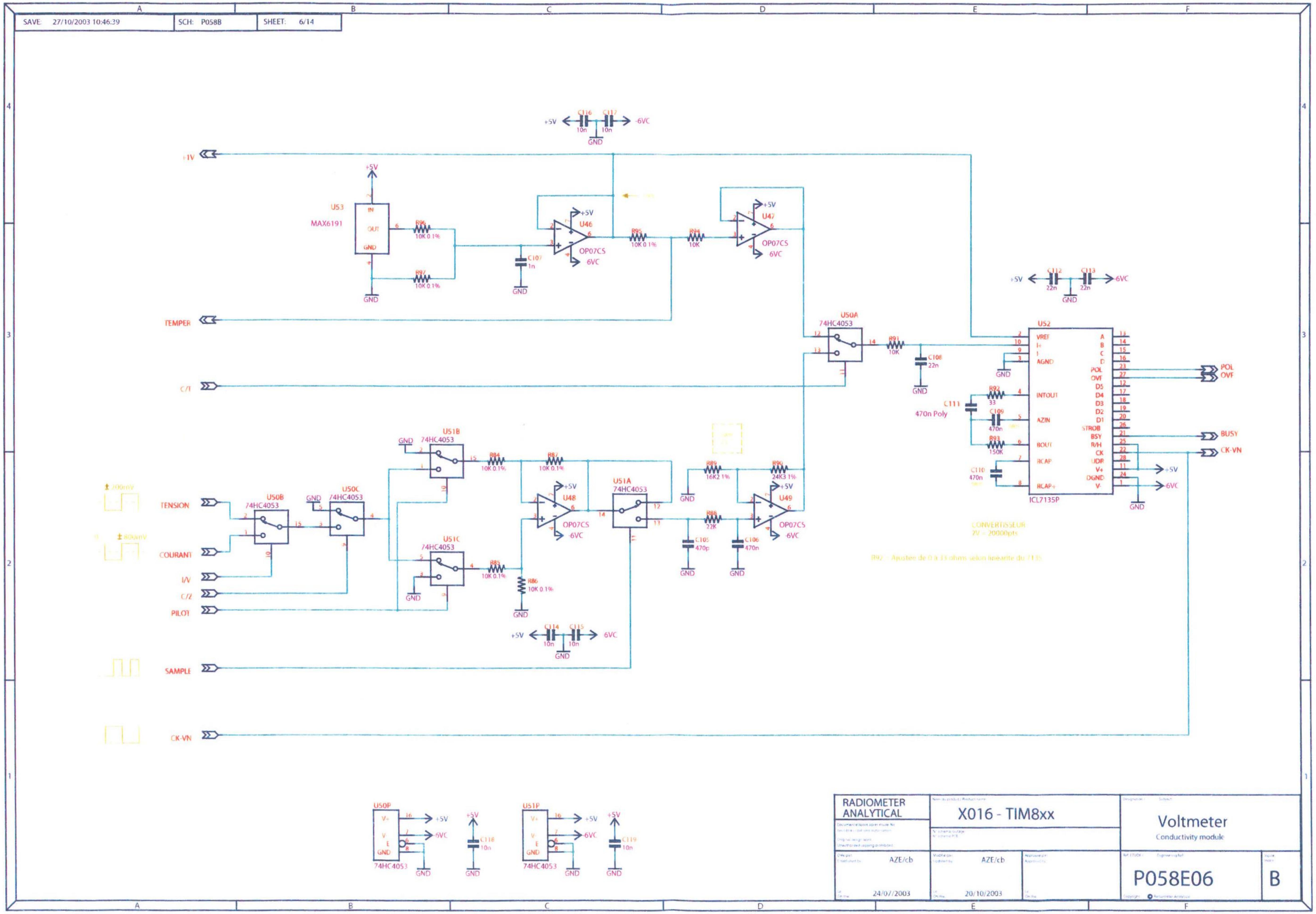

SAVE: 27/10/2003 10:46:39
SCH: P058B
SHEET: 5/14
GA0
GA1
GA2
U31
74HC4051
U32
74HC4051
74HC138
U33
R100 1M 0.1%
1/4W 1AF
R77 100K 0.1%
R78 10K 0.1%
R79 1K 0.1%
R102 100 0.1%
0805
R101 10 0.1%
1/4W 1AF
U34
LF356
T10 BC847B
T9 BC857B
T12 BC857B
T11 BC817B
D1 BAS16
D3 BAS16
R80 10K
R81 1K
R98 30.1 1%
R82 10K
R83 1K
R99 30.1 1%
C103 100p
C104 100p
C266 47n
C267 47n
+5V
-6VC
GND
BC857B T13
BC857B T14
RE3
RE4
R103 10K
R104 10K
D4 BAS16
D6 BAS16
J28
MLSS100-08
PRISE MABC VERS CELLULE
C43 470p
C26 470p
U35 LF356
U36 LF356
U37 LF356
U38 LF356
U39 LF356
U40 LF356
R46 4M7
R47 4M7
R48 4M7
R50 4M7
R52 4M7
R53 4M7
R55 4M7
R56 4M7
R58 22K
R59 22K
C87 100n
C88 22n
C89 100n
C90 22n
C91 100n
C92 22n
C93 100n
C94 22n
R49 10K 0.1%
R51 10K 0.1%
R54 10K 0.1%
R57 10K 0.1%
R60 10K 0.1%
R61 10K 0.1%
R62 10K 0.1%
R63 10K 0.1%
P1 100
Reglage Offset Courant
C95 10n
C96 10n
C97 10n
C98 10n
COURANT
± 100mV
TENSION
± 200mV
TEMPER
+1V
PILOT
SAMPLE
GAIN SORTIE ANA 169...176 mV
R71 1K
R72 16K2 1%
R70 3K48 1%
R67 10K
U41 LF356
C101 100n
C100 100n
R69 22K
C102 470p
U44A 74HC4053
U44B 74HC4053
U44C 74HC4053
U43 OP07CS
R73 10K 0.1%
R74 10K 0.1%
R75 10K 0.1%
R76 10K 0.1%
U42 OP07CS
R65 10K
R66 10K 0.1%
R68 10K
D5 BAS16
±3.5V max
U45A 74HC4053
U45B 74HC4053
± 3V max
C99 470n
0805
R64 1M
C120 10n
C121 10n
C122 10n
C123 10n
U45C 74HC4053
U45P 74HC4053
U44P 74HC4053
C265 10n
C264 10n
U33P
C86 10n
U31P
U32P
RADIOMETER ANALYTICAL
X016 - TIM8xx
Cellule Interface
Conductivity module
Créé par AZE/cb 24/07/2003
Modifié par AZE/cb 20/10/2003
P058E05
B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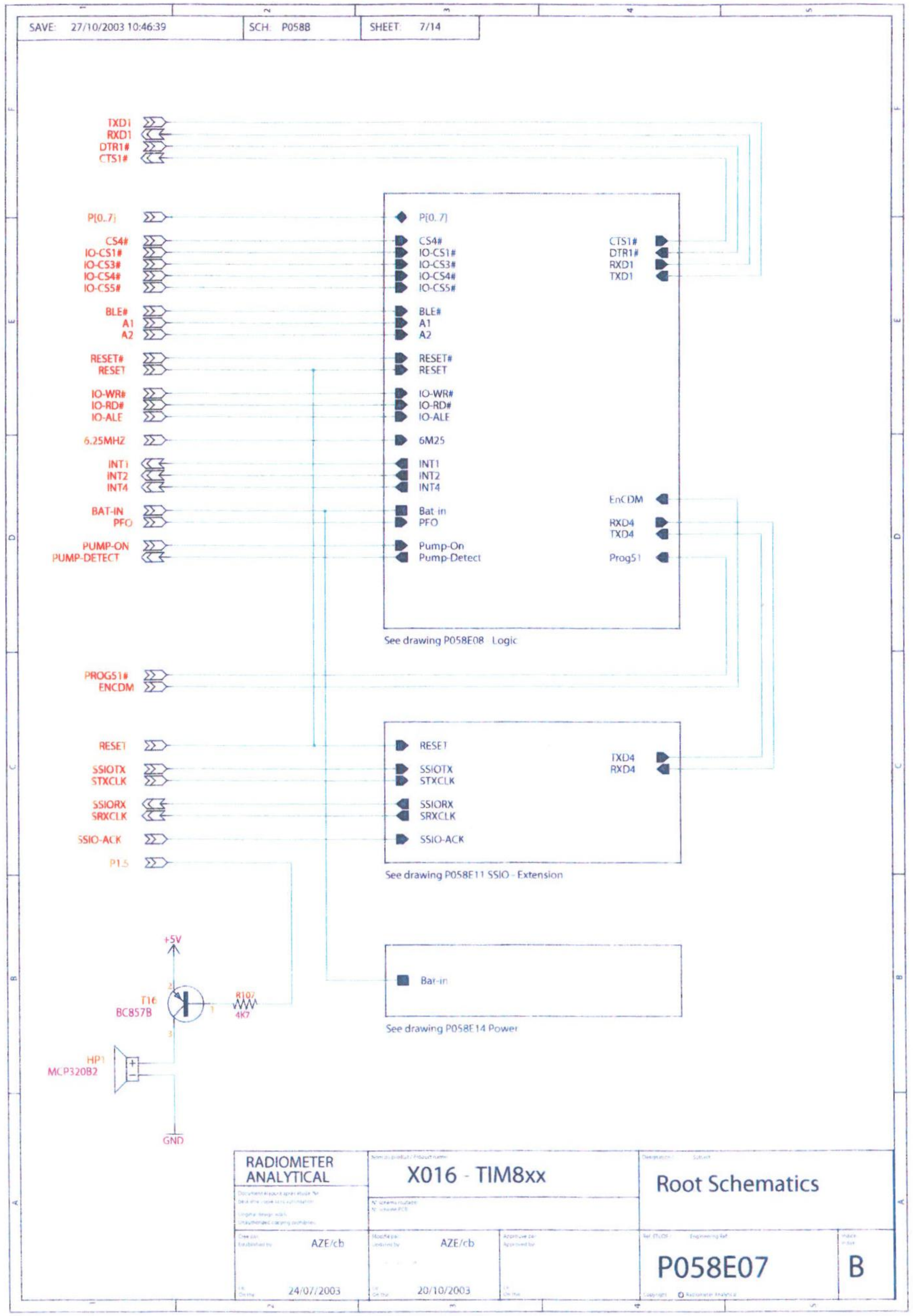
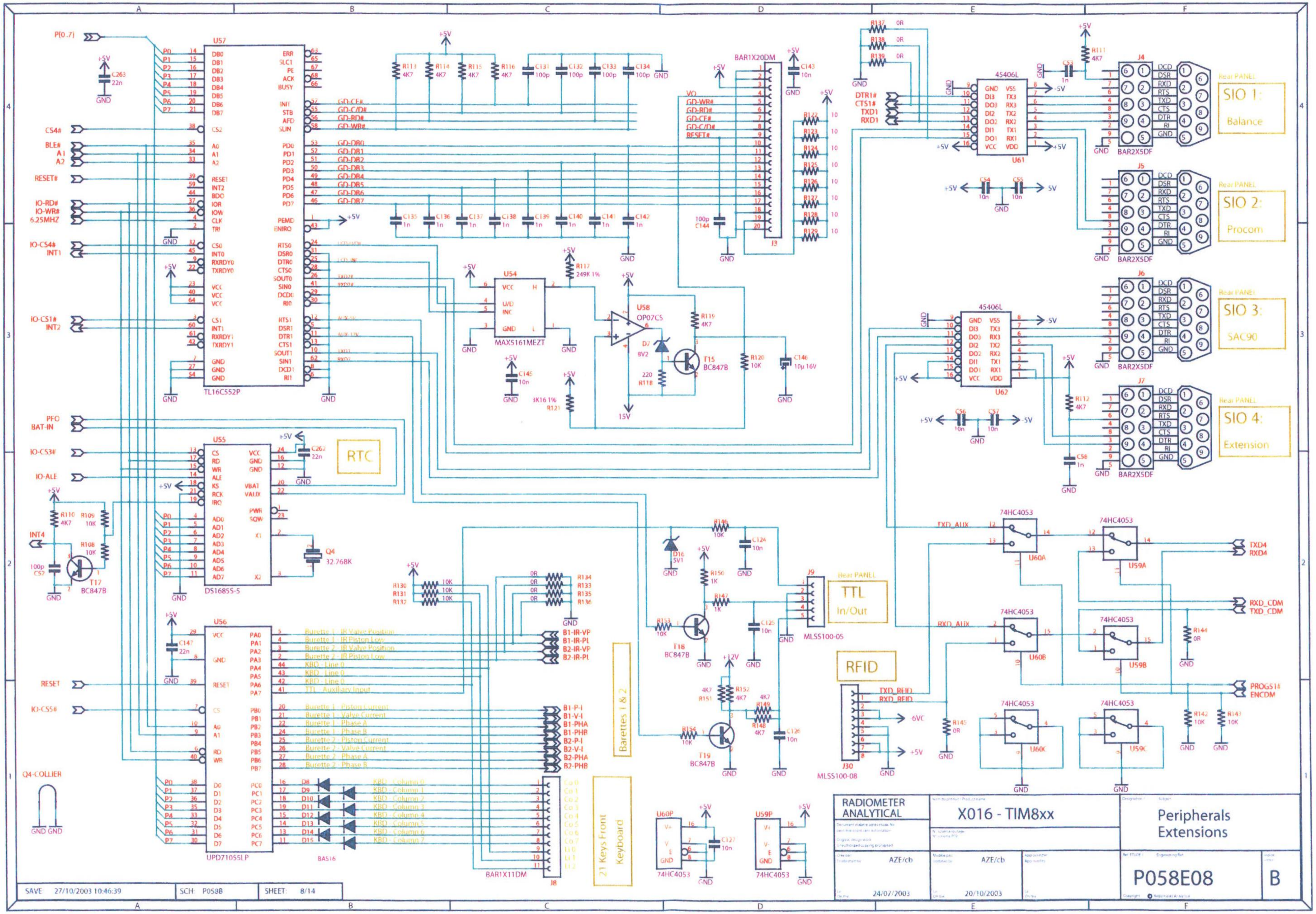
SCH: P058B
SHEET: 6/14
+1V
TEMPER
C/I
TENSION
COURANT
I/V
C/Z
PILOT
SAMPLE
CK-VN
U53
MAX6191
IN
OUT
GND
R90 10K 0.1%
R97 10K 0.1%
C107 1n
U46
OP07CS
R95 10K 0.1%
R94 10K
U47
OP07CS
C116 10n
C117 10n
+5V
-6VC
GND
U50A 74HC4053
R91 10K
C108 22n
C111 470n Poly
R92 33
C109 470n
R93 150K
C110 470n
C112 22n
C113 22n
U52
VREF
I+
I-
AGND
INTOUT
AZIN
BOUT
RCAP-
RCAP+
ICL7135P
POL
OVF
STROB
BSY
R/H
CK
UDR
V+
DGND
V-
BUSY
CK-VN
U51B 74HC4053
U51C 74HC4053
U50B 74HC4053
U50C 74HC4053
U51A 74HC4053
R84 10K 0.1%
R87 10K 0.1%
R85 10K 0.1%
R86 10K 0.1%
U48
OP07CS
R89 16K2 1%
R90 24K3 1%
R88 22K
C105 470p
C106 470n
U49
OP07CS
C114 10n
C115 10n
CONVERTISSEUR
2V = 20000pts
U50P
U51P
74HC4053
C118 10n
C119 10n
RADIOMETER ANALYTICAL
X016 - TIM8xx
Voltmeter
Conductivity module
AZE/cb
24/07/2003
AZE/cb
20/10/2003
P058E06
B


SAVE: 27/10/2003 10:46:39
SCH: P058B
SHEET: 7/14
TXD1
RXD1
DTR1#
CTS1#
P[0..7]
CS4#
IO-CS1#
IO-CS3#
IO-CS4#
IO-CS5#
BLE#
A1
A2
RESET#
RESET
IO-WR#
IO-RD#
IO-ALE
6.25MHZ
INT1
INT2
INT4
BAT-IN
PFO
PUMP-ON
PUMP-DETECT
P[0..7]
CS4#
IO-CS1#
IO-CS3#
IO-CS4#
IO-CS5#
BLE#
A1
A2
RESET#
RESET
IO-WR#
IO-RD#
IO-ALE
6M25
INT1
INT2
INT4
Bat in
PFO
Pump-On
Pump-Detect
CTS1#
DTR1#
RXD1
TXD1
EnCDM
RXD4
TXD4
Prog51
See drawing P058E08 Logic
PROG51#
ENCDM
RESET
SSIOTX
STXCLK
SSIORX
SRXCLK
SSIO-ACK
P1.5
RESET
SSIOTX
STXCLK
SSIORX
SRXCLK
SSIO-ACK
TXD4
RXD4
See drawing P058E11 SSIO - Extension
Bat-in
See drawing P058E14 Power
+5V
T16
BC857B
2
1
3
R107
4K7
HP1
MCP320B2
+
-
GND
RADIOMETER ANALYTICAL
X016 - TIM8xx
Root Schematics
AZE/cb
24/07/2003
AZE/cb
20/10/2003
P058E07
B
Radiometer Analytical


P[0..7]
U57
TL16C552P
CS4#
BLE#
A1
A2
RESET#
IO-RD#
IO-WR#
6.25MHZ
IO-CS4#
INT1
IO-CS1#
INT2
GD-CF#
GD-C/D#
GD-RD#
GD-WR#
GD-DB0
GD-DB1
GD-DB2
GD-DB3
GD-DB4
GD-DB5
GD-DB6
GD-DB7
BAR1X20DM
J3
U54
MAX5161MEZT
U58
OP07CS
T15
BC847B
45406L
U61
U62
J4
SIO 1:
Balance
J5
SIO 2:
Procom
J6
SIO 3:
SAC90
J7
SIO 4:
Extension
Rear PANEL
BAR2X5DF
DTR1#
CTS1#
TXD1
RXD1
PFO
BAT-IN
IO-CS3#
IO-ALE
U55
DS1685S-5
RTC
Q4
32.768K
INT4
T17
BC847B
U56
UPD71055LP
RESET
IO-CS5#
Burette 1 : IR Valve Position
Burette 1 : IR Piston Low
Burette 2 : IR Valve Position
Burette 2 : IR Piston Low
KBD : Line 0
KBD : Line 1
KBD : Line 2
TTL : Auxiliary Input
Burette 1 : Piston Current
Burette 1 : Valve Current
Burette 1 : Phase A
Burette 1 : Phase B
Burette 2 : Piston Current
Burette 2 : Valve Current
Burette 2 : Phase A
Burette 2 : Phase B
KBD : Column 0
KBD : Column 1
KBD : Column 2
KBD : Column 3
KBD : Column 4
KBD : Column 5
KBD : Column 6
KBD : Column 7
BAS16
B1-IR-VP
B1-IR-PL
B2-IR-VP
B2-IR-PL
B1-P-I
B1-V-I
B1-PHA
B1-PHB
B2-P-I
B2-V-I
B2-PHA
B2-PHB
Barettes 1 & 2
21 Keys Front Keyboard
BAR1X11DM
J8
J9
TTL In/Out
MLSS100-05
T18
BC847B
T19
BC847B
RFID
TXD_RFID
RXD_RFID
J30
MLSS100-08
74HC4053
U60A
U59A
U60B
U59B
U60C
U59C
U60P
U59P
TXD_AUX
RXD_AUX
TXD4
RXD4
RXD_CDM
TXD_CDM
PROGS1#
ENCDM
Q4-COLLIER
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SCH: P058B
SHEET: 8/14
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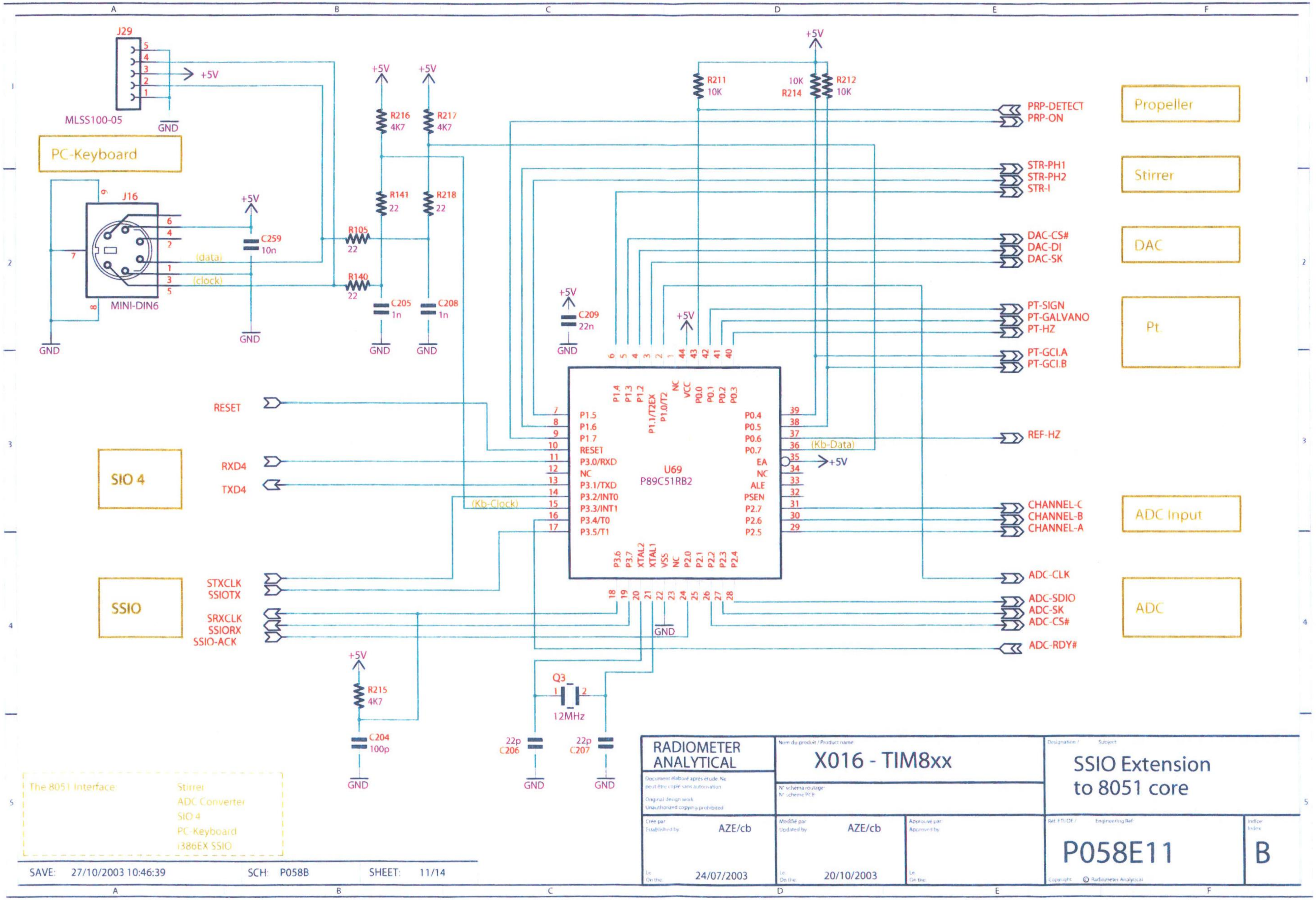
X016 - TIM8xx
Peripherals Extensions
AZE/cb
24/07/2003
AZE/cb
20/10/2003
P058E08
B


J29
MLSS100-05
+5V
GND
PC-Keyboard
J16
MINI-DIN6
(data)
(clock)
C259
10n
R105
22
R140
22
R216
4K7
R217
4K7
R141
22
R218
22
C205
1n
C208
1n
C209
22n
R211
10K
R212
10K
R214
10K
U69
P89C51RB2
P1.5
P1.6
P1.7
RESET
P3.0/RXD
NC
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P0.4
P0.5
P0.6
P0.7
EA
NC
ALE
PSEN
P2.7
P2.6
P2.5
P1.4
P1.3
P1.2
P1.1/T2EX
P1.0/T2
VCC
P0.0
P0.1
P0.2
P0.3
P3.6
P3.7
XTAL2
XTAL1
VSS
P2.0
P2.1
P2.2
P2.3
P2.4
(Kb-Data)
(Kb-Clock)
RESET
RXD4
TXD4
SIO 4
SSIO
STXCLK
SSIOTX
SRXCLK
SSIORX
SSIO-ACK
R215
4K7
C204
100p
Q3
12MHz
C206
22p
C207
22p
PRP-DETECT
PRP-ON
Propeller
STR-PH1
STR-PH2
STR-I
Stirrer
DAC-CS#
DAC-DI
DAC-SK
DAC
PT-SIGN
PT-GALVANO
PT-HZ
PT-GCI.A
PT-GCI.B
Pt.
REF-HZ
CHANNEL-C
CHANNEL-B
CHANNEL-A
ADC Input
ADC-CLK
ADC-SDIO
ADC-SK
ADC-CS#
ADC-RDY#
ADC

The 8051 Interface:

- Stirrer
- ADC Converter
- SIO 4
- PC-Keyboard
- i386EX SSIO

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Nom du produit / Product name
X016 - TIM8xx

N° schéma routage
N° scheme PCB

Designation / Subject
SSIO Extension
to 8051 core

Crée par / Established by AZE/cb
Le / On the 24/07/2003

Modifié par / Updated by AZE/cb
Le / On the 20/10/2003

Approuvé par / Approved by
Le / On the

Réf. ETUDE / Engineering Ref
P058E11

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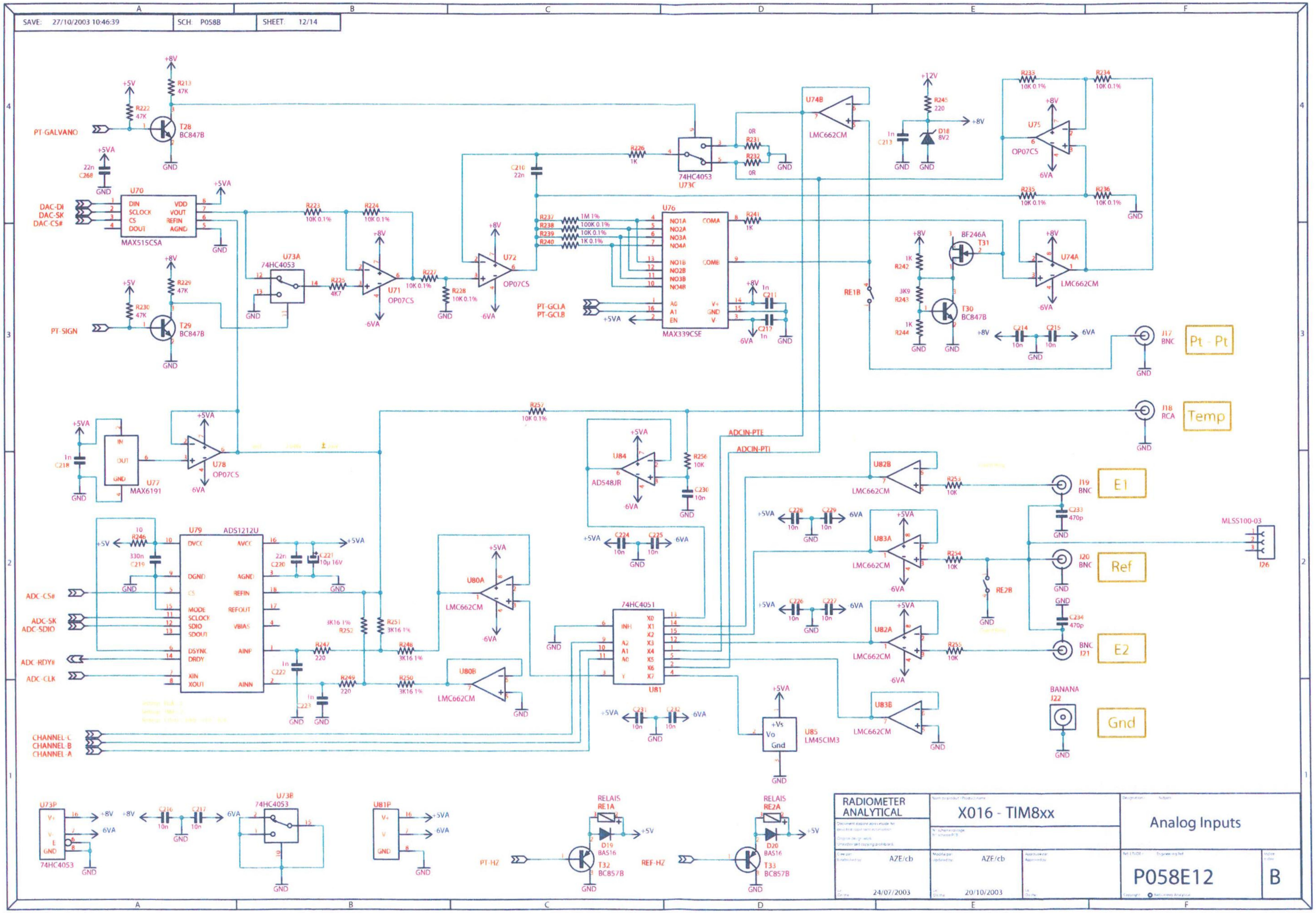
A
B
C
D
E
F
1
2
3
4
PT-GALVANO
T28
BC847B
R213
47K
R222
47K
C268
22n
DAC-DI
DAC-SK
DAC-CS#
U70
MAX515CSA
DIN
SCLOCK
CS
DOUT
VDD
VOUT
REFIN
AGND
PT-SIGN
T29
BC847B
R229
47K
R230
47K
U73A
74HC4053
R225
4K7
R223
10K 0.1%
R224
10K 0.1%
U71
OP07CS
R227
10K 0.1%
R228
10K 0.1%
U72
OP07CS
C210
22n
R226
1K
74HC4053
U73C
R231
0R
R232
0R
U74B
LMC662CM
R237
R238
R239
R240
1M 1%
100K 0.1%
10K 0.1%
1K 0.1%
U76
MAX339CSE
NO1A
NO2A
NO3A
NO4A
NO1B
NO2B
NO3B
NO4B
COMA
COMB
A0
A1
EN
R241
1K
PT-GCLA
PT-GCLB
C211
1n
C217
1n
+12V
R245
220
C213
1n
D18
8V2
R233
10K 0.1%
R234
10K 0.1%
U75
OP07CS
R235
10K 0.1%
R236
10K 0.1%
BF246A
T31
R242
1K
R243
3K9
R244
1K
T30
BC847B
U74A
LMC662CM
RE1B
C214
10n
C215
10n
J17
BNC
Pt - Pt
U77
MAX6191
C218
1n
U78
OP07CS
R257
10K 0.1%
J18
RCA
Temp
U84
AD548JR
R256
10K
C230
10n
ADCIN-PTE
ADCIN-PTI
U82B
LMC662CM
R253
10K
J19
BNC
E1
C233
470p
C226
10n
C229
10n
U83A
LMC662CM
R254
10K
RE2B
J20
BNC
Ref
MLSS100-03
J26
C234
470p
U82A
LMC662CM
R255
10K
J21
BNC
E2
U83B
LMC662CM
BANANA
J22
Gnd
U85
LM45CIM3
+Vs
Vo
Gnd
U79
ADS1212U
R246
10
C219
330n
C220
22n
C221
10µ 16V
DVCC
AVCC
DGND
AGND
MODE
SCLOCK
SDIO
SDOUT
DSYNC
DRDY
XIN
XOUT
REFIN
REFOUT
VBIAS
AINP
AINN
ADC-CS#
ADC-SK
ADC-SDIO
ADC-RDY#
ADC-CLK
C222
1n
C223
1n
R247
220
R249
220
R252
3K16 1%
R251
3K16 1%
R248
3K16 1%
R250
3K16 1%
U80A
LMC662CM
U80B
LMC662CM
C224
10n
C225
10n
74HC4051
U81
INH
A2
A1
A0
X0
X1
X2
X3
X4
X5
X6
X7
C231
10n
C232
10n
CHANNEL-C
CHANNEL-B
CHANNEL-A
U73P
74HC4053
C216
10n
C217
10n
U73B
74HC4053
U81P
RELAIS
RE1A
D19
BAS16
T32
BC857B
PT-HZ
RE2A
D20
BAS16
T33
BC857B
REF-HZ
+5V
+8V
+5VA
-6VA
6VA
GND

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X016 - TIM8xx

Analog Inputs

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AZE/cb 20/10/2003

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B

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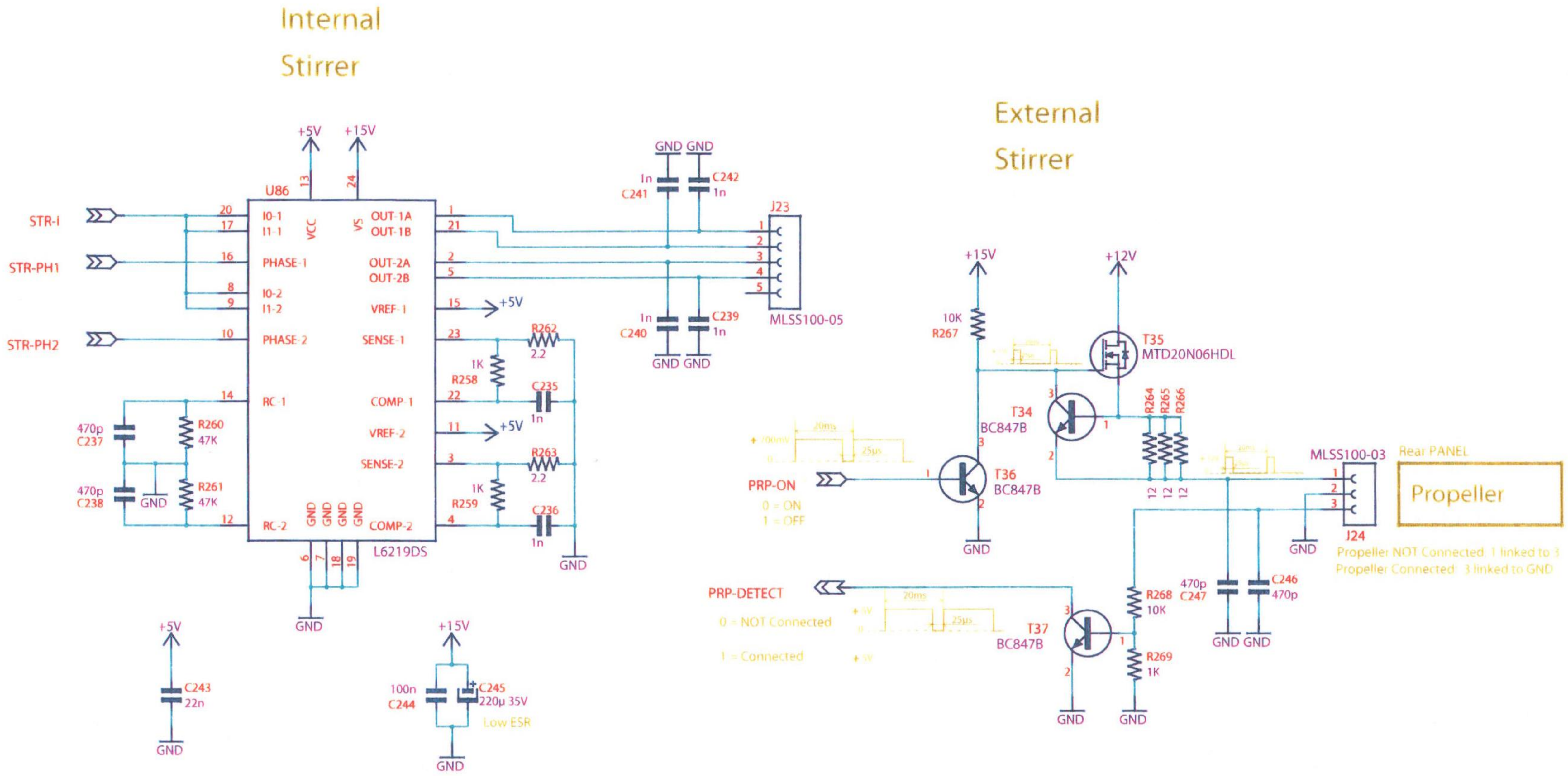
Internal Stirrer
External Stirrer
STR-I
STR-PH1
STR-PH2
U86
L6219DS
+5V
+15V
I0-1
I1-1
PHASE-1
I0-2
I1-2
PHASE-2
RC-1
RC-2
VCC
VS
OUT-1A
OUT-1B
OUT-2A
OUT-2B
VREF-1
SENSE-1
COMP-1
VREF-2
SENSE-2
COMP-2
GND
R262 2.2
R258 1K
C235 1n
R263 2.2
R259 1K
C236 1n
470p C237
R260 47K
470p C238
R261 47K
C241 1n
C242 1n
C240 1n
C239 1n
J23
MLSS100-05
C243 22n
100n C244
C245 220µ 35V
Low ESR
10K R267
+12V
T35 MTD20N06HDL
T34 BC847B
R264
R265
R266
12 12 12
T36 BC847B
PRP-ON
0 = ON
1 = OFF
+700mV
20ms
25µs
PRP-DETECT
0 = NOT Connected
1 = Connected
+5V
T37 BC847B
R268 10K
R269 1K
470p C247
C246 470p
MLSS100-03
Rear PANEL
Propeller
J24
Propeller NOT Connected: 1 linked to 3
Propeller Connected: 3 linked to GND

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Nom du produit / Product name: X016 - TIM8xx

N° schéma routage / N° scheme PCB:

Designation / Subject: Stirrers

Crée par / Established by: AZE/cb
Le / On the: 24/07/2003

Modifié par / Updated by: AZE/cb
Le / On the: 20/10/2003

Approuvé par / Approved by:
Le / On the:

Ref. ETUDE / Engineering Ref: P058E13

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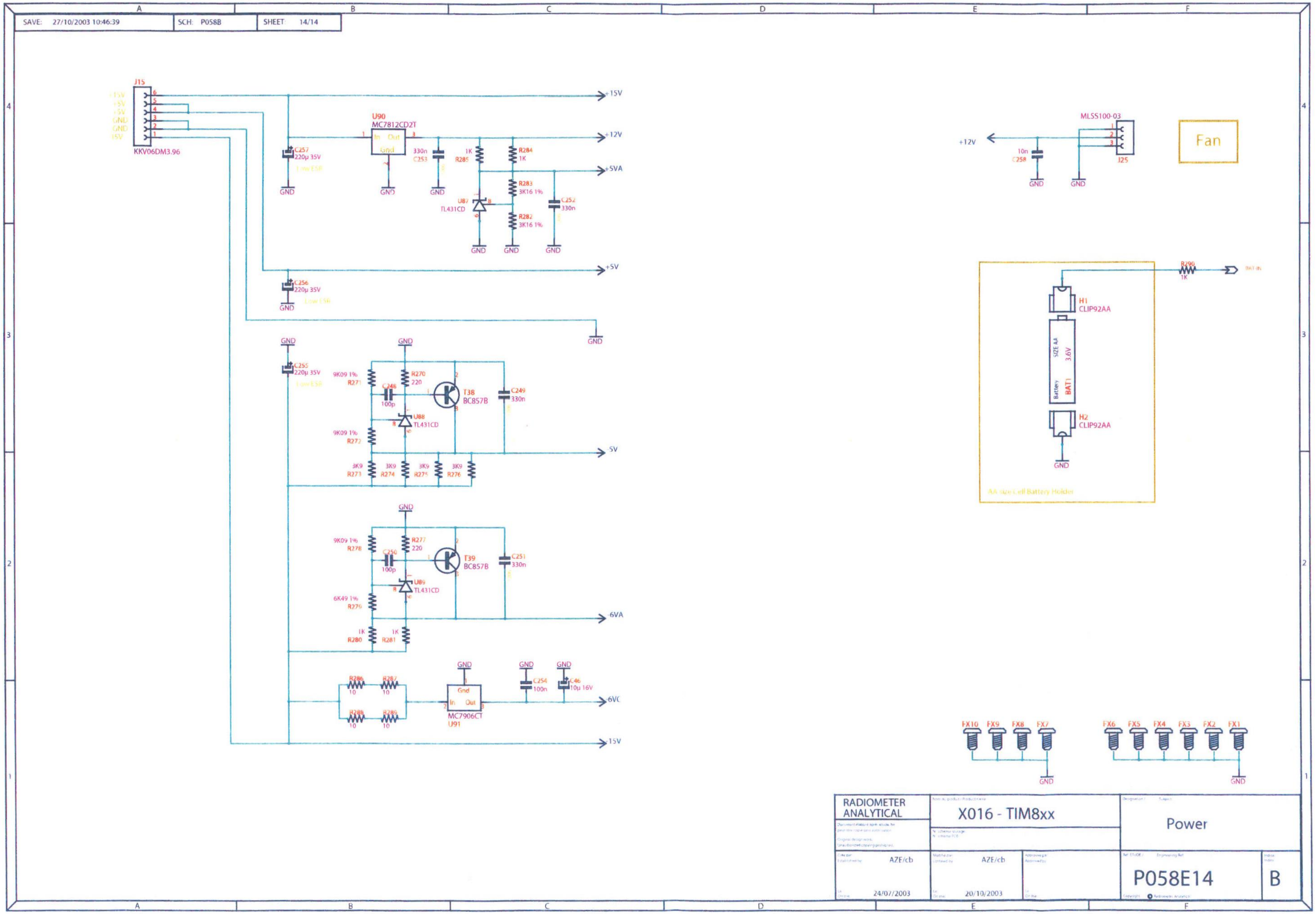
SAVE: 27/10/2003 10:46:39
SCH: P058B
SHEET 14/14
A
B
C
D
E
F
1
2
3
4
J15
+15V
+5V
+5V
GND
GND
15V
6
5
4
3
2
1
KKV06DM3.96
+15V
U90
MC7812CD2T
In
Out
Gnd
1
3
2
C257
220µ 35V
Low ESR
GND
330n
C253
1K
R285
R284
1K
+12V
+5VA
R283
3K16 1%
U87
TL431CD
R282
3K16 1%
C252
330n
+5V
C256
220µ 35V
Low ESR
GND
C255
220µ 35V
Low ESR
9K09 1%
R271
C248
100p
R270
220
T38
BC857B
C249
330n
U88
TL431CD
9K09 1%
R272
5V
3K9
R273
3K9
R274
3K9
R275
3K9
R276
9K09 1%
R278
C250
100p
R277
220
T39
BC857B
C251
330n
U89
TL431CD
6K49 1%
R279
6VA
1K
R280
1K
R281
R286
10
R287
10
R288
10
R289
10
MC7906CT
U91
C254
100n
C46
10µ 16V
6VC
15V
ML5S100-03
+12V
10n
C258
J25
Fan
H1
CLIP92AA
SIZE AA
3.6V
Battery
BAT1
H2
CLIP92AA
AA size Cell Battery Holder
R290
1K
FX10
FX9
FX8
FX7
FX6
FX5
FX4
FX3
FX2
FX1
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Nom du produit / Product name
X016 - TIM8xx
N° schéma routage
N° schéma PCB
Designation / Subject
Power
Créé par Established by
AZE/cb
Le On the
24/07/2003
Modifié par Contained by
AZE/cb
Le On the
20/10/2003
Approuvé par Approved by
Le On the
Ref ETUDE / Engineering Ref
P058E14
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8. Technical notes

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